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U. S. Capitol, Citadel of Democracy

With 56 Illustrations
32 in Natural Colors

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High Adventure in the Himalayas

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THE NATIONAL GEOGRAPHIC MAGAZINE



U. S. Capitol, Citadel of Democracy

By LONNELL AIKMAN



"**Y**OUR CAPITOL," I once heard a Latin-American ambassador say, "really looks the part. With a position on a hill like that, it could be magnificent or ridiculous. It is magnificent!"

By night, batteries of searchlights trace this building's glowing dome on the blue-black vault of the sky. By day, sunshine and drifting clouds make picture-postcard scenes of the silhouette that symbolizes American democracy around the country and the world.

Through all the weather's moods, the United States Capitol dominates Washington's sky-

line. Only the slim shaft of the Washington Monument can challenge the lawmakers' 287-foot eminence atop old Jenkins Hill, which the city's first planner, Pierre Charles L'Enfant, called "a pedestal waiting for a monument."

To keep others from looking down on this citadel, building heights in the neighborhood are sharply restricted.

Seen from a distance, the Capitol has an air of solid majesty, a personality that seems placid and unchanging. Actually, within the thick walls for which President Washington laid the cornerstone in 1793, the story of this



Busy as a Beehive, the Capitol Swarms with Senators, Representatives, and Sight-seers

On "the Hill," hub of the Washington street system, stands the 287-foot Capitol, where the Nation's laws are made. Its original design was submitted in the 1792 competition by William Thornton, an amateur architect trained as a physician. Many changes have been made, including these 56 steps to the portico.

building is one of ceaseless variety, conflict, and motion.

Surrounding the formal halls where Senate and House of Representatives debate and decide the Nation's laws are hundreds of smaller rooms—committee and office rooms; administrative, clerical, and utility quarters; exhibit halls swarming with visitors.

A City in Four Walls

"This is almost a city in itself," said the veteran Architect of the Capitol, David Lynn, whose numerous duties include the maintenance, structural care, and improvement of the home of Congress.

Wandering miles along the corridors, I could see what he meant. I caught glimpses of restaurants and kitchens; stationery, barber, and carpenter shops, ticket offices, disbursing and banking offices, post offices, and even dis-

pensaries and the attending physician's office.

As a footloose correspondent, I was permitted to explore libraries and document rooms that serve the Members of Congress. I checked in at police headquarters to talk with officers who guard the Capitol and its 131-acre grounds. I saw reception rooms and private dining rooms where the President is entertained on visits with congressional dignitaries.

Beyond the steep galleries that look down on the sessions of Senate and House, I walked through rooms full of desks, typewriters, and telephones where reporters for daily press, periodicals, radio, and television turn out each day's grist of news (pages 180, 182).

Yet, for all the stir and bustle, a spirit of history broods over the Capitol. It fills the air in legislative chambers that once echoed to the oratory of America's political giants, the bitter arguments of the "great debates."



National Geographic Photographer Willard E. Cramer

Juliana: "Mankind . . . Has to Trust Largely to Your Good Judgment for Its Deliverance"

The Queen of the Netherlands, speaking on cooperation between the North Atlantic Treaty powers, addressed Congress in joint meeting in the House Chamber on April 3, 1952. President of the Senate Barkley and Speaker of the House Rayburn sit behind her. Prince Bernhard (front row, lower left) listens to his Queen.

No other building in the country can summon so many illustrious ghosts: Jefferson, Adams, and Lincoln; Webster, Clay, and Calhoun. There were the Chief Justices John Marshall, Charles Evans Hughes, and William Howard Taft, the only man in American history to serve both as President and as Chief Justice.

Art Teaches History

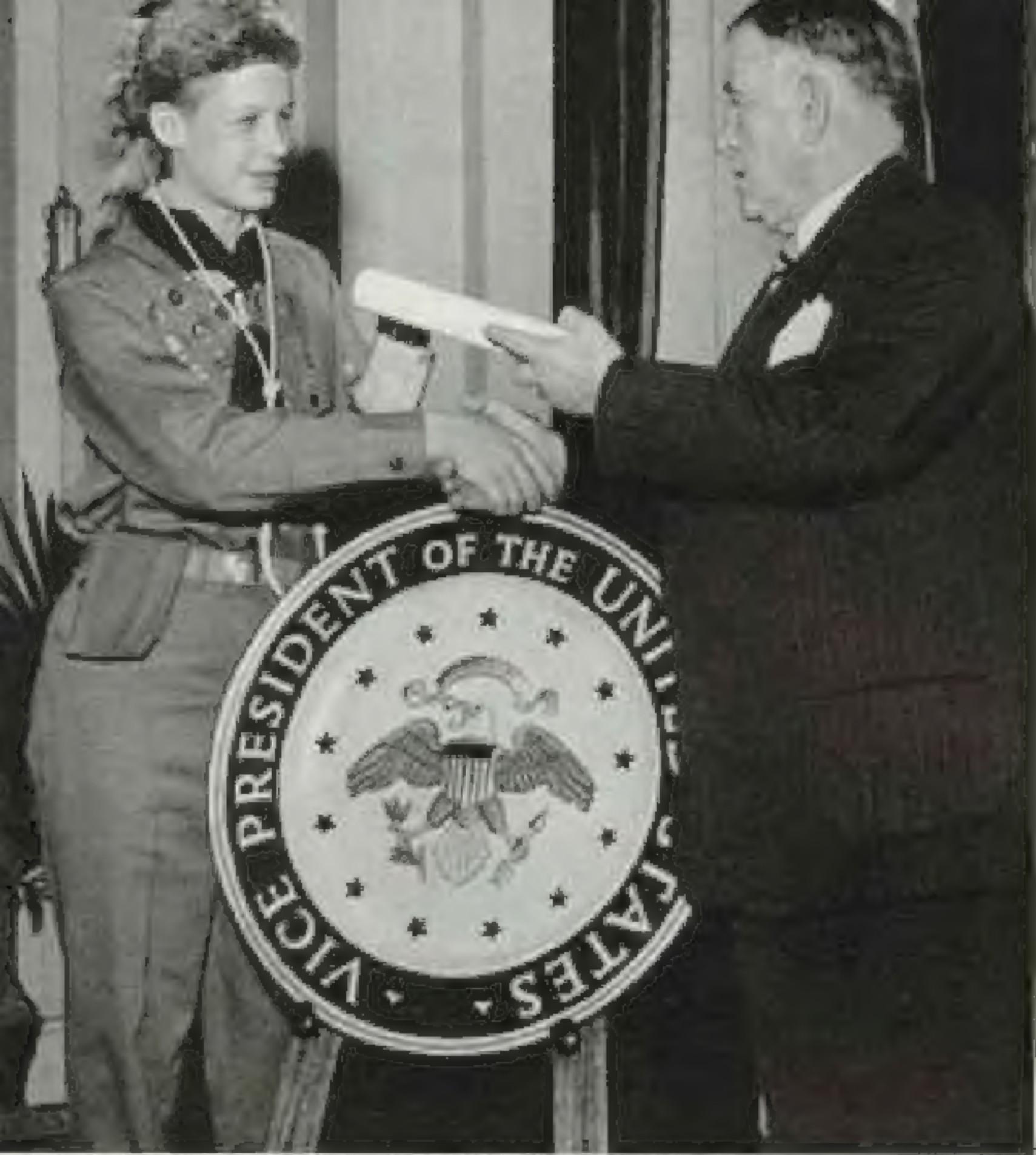
The past lingers in the antique mirrors and marble fireplaces of modern offices. Statues and portraits of statesmen and soldiers look down soberly on every chamber and corridor.

For the Capitol is more than a legislative factory. It is one of the Nation's foremost showplaces. Its art galleries and columned halls, its decorations and memorials are fascinating not only in themselves but in their graphic presentation of the American story.

Would you like to see what the first Speaker of the House, Frederick Augustus Conrad Muhlenberg, looked like? You will find his portrait hanging, with those of others who have held the post, in the long Speakers Lobby outside the Hall of Representatives.

The round, serene face of this Pennsylvania clergymen, who served in the Continental Congress and the first four Congresses of the United States, belies the fiery period of revolution and post-revolution in which he lived.

Or you may want to look up the bronze or marble likeness of the distinguished son chosen to represent your State in Statuary Hall (page 148). Of the 40 States which so far have contributed statues in response to the congressional invitation of 1864, only one has selected a favorite daughter. She was Frances E. Willard of Illinois, ardent feminist leader and temperance crusader.



Mr. Barkley Honors Daniel Boone VII

Vice President Alben Barkley, who used to represent Kentucky in the Senate, makes a Kentucky colonel of young Boone. The boy, a descendant of the famous frontiersman, wears a coonskin cap and the Boy Scouts' merit badge sash. The Vice President's seal, which stands on the easel in Mr. Barkley's office, was created by a Presidential order in 1948.

* Girl Scouts Pass the Cookies

Sam Rayburn, Speaker of the House, and Joseph W. Martin, Jr., House minority leader, sample the offerings before contributing to the Girl Scouts camping fund. Left to right, the girls are Anne and Lena Thomas, daughters of the Texas Representative; Linda Kofauver, daughter of the Tennessee Senator; and Martha Miller, from Texas.

National Geographic Photographers
D. ANTHONY STINNET AND JAMES E. PITTNER





National Geographic Photographers E. Anthony Stewart and John R. Fletcher

Ohio's Robert A. Taft Greets Visitors in the Senators' Reception Room

Constituents, lobbyists, and sometimes feathered Indians meet their Senators here. Constantino Brumidi, who decorated much of the Capitol in 25 industrious years, lacked time to fill the empty medallions (pages 164, 168).



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National Geographic Photographers R. Arthur Stover and John E. Fluehr

The Guide Whispers; Echo Carries Her Words Across Statuary Hall

Bronze and marble statues contributed by 40 States in honor of distinguished sons and one daughter give this room its name. Here the House met from 1807 to 1857, and here Representative John Quincy Adams, a former President, was mortally stricken with paralysis (pages 145, 152). Statues (l. to r.) show Delaware's Caesar Rodney, Ohio's William Allen, Arkansas's Uriah M. Rose, Mississippi's Jefferson Davis (bronze), Virginia's Robert E. Lee (bronze), and Rhode Island's Roger Williams. California's Junipero Serra (bronze) holds a cross, and Pennsylvania's Robert Fulton looks at a ship model.

Or perhaps you had forgotten the story of Edward Dickinson Baker, whose life-sized toga-draped figure stands in the high-domed Rotunda along with those of Washington, Jefferson, Lincoln, and others. Senator Baker of Oregon, Civil War hero and close friend of Lincoln, was killed as he led Union forces into action at Balls Bluff, Virginia.

According to contemporary news reporters, Lincoln wept when he learned of Baker's death. Congress later singled out the Oregonian for his place of honor in the Rotunda.

All three branches of the United States Government figure in the Capitol's history.

In one room or another of the old Senate wing the Supreme Court sat from 1801 until 1935. Most of our Presidents have taken the oath of office—some in rain or snow—outside the main east entrance.

Just before each Presidential inauguration, incoming Vice Presidents traditionally have been inducted into office in the Senate Chamber, where they also automatically assumed the role of President of the Senate. Since 1937, however (with the exception of the 1945 ceremonies at the White House), the Vice Presidential swearing-in has been part of the inaugural procedures on the Capitol's east-front platform.

How the Capitol Has Grown

Physically, the Capitol has grown up by bits and pieces, its construction alternately promoted and delayed by national pride and practical difficulties. The process began years before the Federal Government was moved, in 1800, to the wilderness capital by the Potomac,



National Geographic Photographer Edward R. Pense

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An Artist Sitting on the Platform-supported Canvas Cleans a Rotunda Painting

Marie Kalnoky freshens "The Surrender of General Burgoyne," one of four documentary pictures made by John Trumbull especially for the Capitol (pages 154, 156, 157, and 177). Trumbull (1756-1843), who drew on his own Revolutionary experiences, had the additional advantage of painting his heroes in the flesh.

Curiously, the original design for this building—the only one submitted that met George Washington's specifications for "grandeur, simplicity, and convenience"—was the work of an amateur architect. Dr. William Thornton, who won \$500 and a city lot for his entry in the Capitol competition of 1792, was a physician by training.

Brilliant and versatile, Dr. Thornton turned out his classically based design with as much ease, apparently, as he dashed off poetry, painted portraits, and experimented with steamboats and speech for the deaf.

Talented professionals—notably Benjamin H. Latrobe, Charles Bulfinch, and Thomas U. Walter—made their contributions as Capitol Architects. Despite disputes and setbacks, they tailored and merged the various elements and additions into the present structure.

But the record also gives credit for the overall success of the work to the guiding role of

other amateurs in architecture—the successive Presidents of the United States.

Both Washington and Jefferson had a direct hand not only in making broad decisions affecting the building's design, but in such practical measures as importing hard-to-find skilled masons, carpenters, and sculptors.

So closely was Jefferson associated with plans for the Capitol that he has been erroneously credited with certain of its more original designs. It seemed logical, for example, to attribute Latrobe's charming and unusual cornstalk and tobacco decorations at the head of some of the interior columns to Monticello's master of the ingenious gadget (page 170).*

Oldest section of the Capitol is the rectangular north wing, now the connecting link between the central Rotunda and the big Senate extension (chart, pages 174-175).

* See "Mr. Jefferson's Charlottesville," by Anne Revis, NATIONAL GEOGRAPHIC MAGAZINE, May, 1950.

It was there, in a building of propped-up arches and temporary partitions, that Congress held its first joint session on November 22, 1800. It was addressed by President John Adams, who, with his wife Abigail, was having his own housekeeping troubles in the new White House at the other end of the forest-and-meadow-framed trail ambitiously called Pennsylvania Avenue.

Congressmen Baked in an "Oven"

Some seven years more were to pass before the Capitol's twin south wing, including what is now Statuary Hall, was ready for the House of Representatives. Meanwhile, the Representatives met in the Senators' north building, with a three-year interlude in a queer oval-shaped structure temporarily erected on the south site and descriptively known as the "Oven."

Even before the move into the Oven, the original House Chamber in the north wing was the scene, in February, 1801, of the exciting climax to Washington's first major political struggle. The issue was the contested Presidential election between the two leading candidates, Jefferson and Aaron Burr, the latter already a sinister figure. Since the electoral vote was tied, it was up to the House, under the constitutional rules of the day, to make the decision that would give one man the Presidency, the other the Vice Presidency.

The eyes of a tense nation turned to the House as a six-day deadlock followed. During the final 30-hour struggle before Jefferson was announced the winner, one determined Member voted from a sickbed set up at the scene of action!

In these early building phases the two Capitol units were united only by a wooden walkway. At one time, public springs bubbled in the intervening open space; around them children played and neighboring housewives gathered to gossip and fill their buckets.

It was not until the reconstruction after the burning of the building in the War of 1812 that a connecting rotunda came into being. Completed in the mid-1820's, its low, copper-covered wooden dome was modest compared with the towering iron dome that eventually was to take its place.

But the country was growing fast—almost doubling its population every two decades—and the Federal Capitol on Jenkins Hill both reflected and influenced the changes and developments.

A dozen States joined the Union between 1820 and the outbreak of the Civil War. With each newcomer, more and more Members were added to Congress. Debates also grew hotter and more complex—the Missouri Compromise of 1820; Andrew Jackson's bank battles of

the 1830's; the slave and free-State controversies of the 1850's.

Today, in the quiet, seldom used Old Senate Chamber, you find a small picture showing this room just as it was in 1850. Below it hangs a chart of each Senator's place.

"There's where Webster, Clay, and Calhoun sat," said my companion, Col. Carl Miller, of the Capitol's professional Guide Service. "Sam Houston, who'd been President of the Republic of Texas twice, was here then. So was Stephen Douglas, even before his debates with Lincoln. And Seward and Chase, who later served in Lincoln's Cabinet. And his Vice President, Hannibal Hamlin."

I followed his finger down the list. "And look! Jefferson Davis, too. With so much in the history books about Davis as President of the Confederacy, you forget he had an important Senate career before."

Barracks, Bakery, and Hospital

Through the years, neither crisis nor war halted the Capitol's growth. In 1850, despite the approaching civil conflict, Congress voted funds for two big extensions.

The first session of the House (237 Members) was held in the new south-wing addition in December, 1857. Nearly a year and a month later, the Senate moved over to the comparable north building, while the Supreme Court transferred its quarters from the ground floor into the vacated Senate Chamber.

During the fateful days of the Civil War, when Washington was a borderline town and sometimes a beleaguered one, the Capitol served as barracks, military bakery, and hospital.

Some of the Union's first volunteer troops were quartered in the Senate and House Chambers; there they amused themselves by holding mock legislative sessions. Others slept on the floor of the Rotunda, their new rifles stacked high under John Trumbull's historic paintings of the Revolution.

At one time long lines of dusty wagons rolled up to the basement entrances bearing valuable loads of flour evacuated from threatened Georgetown bakeries. Later, as the wounded paraded back from the battlefields into the crowded, harried city, volunteer nurses and doctors found their patients in rows of hospital beds set up between the statues and busts.

Above all the activities, the clanking and pounding of workmen putting up the vast new cast-iron dome went on. For President Lincoln, who had known this building well as an Illinois Congressman from 1847 to '49, was determined to keep the construction going as a symbol of the strength and the future of the Union (page 168).



ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED





The Sons of Mississippi Discovered the President's Dept. to Impress Visitors to the Rotunda
W. D. L. and T. J. G. Chapman photo, courtesy of the Library of Congress

American and French Neutrality Utmost Scruples in Yorktown, 1781. George Washington Sits on His Chair (Right) in Front of a Large Fire. The French General Lafayette Sits on the Left. The British General Cornwallis is Seated in a Chair on the Right.







[Figure 1] by [Figure 1] by [Figure 1]





Festivals on Lake Traù:

White Lotus Festival
The Beginning and
The End of the Year

The White Lotus Festival is held annually on the lake, featuring traditional performances, music, and dance. The festival marks the beginning of the new year and is a time for community members to come together and celebrate. The festival also includes a variety of food and drink offerings, as well as a special ceremony where offerings are made to the spirits of the lake.

The Beginning and the End of the Year is another important festival on the lake. It is a time for people to reflect on the past year and look forward to the future. The festival includes traditional performances, music, and dance, as well as a variety of food and drink offerings. The festival also includes a special ceremony where offerings are made to the spirits of the lake.

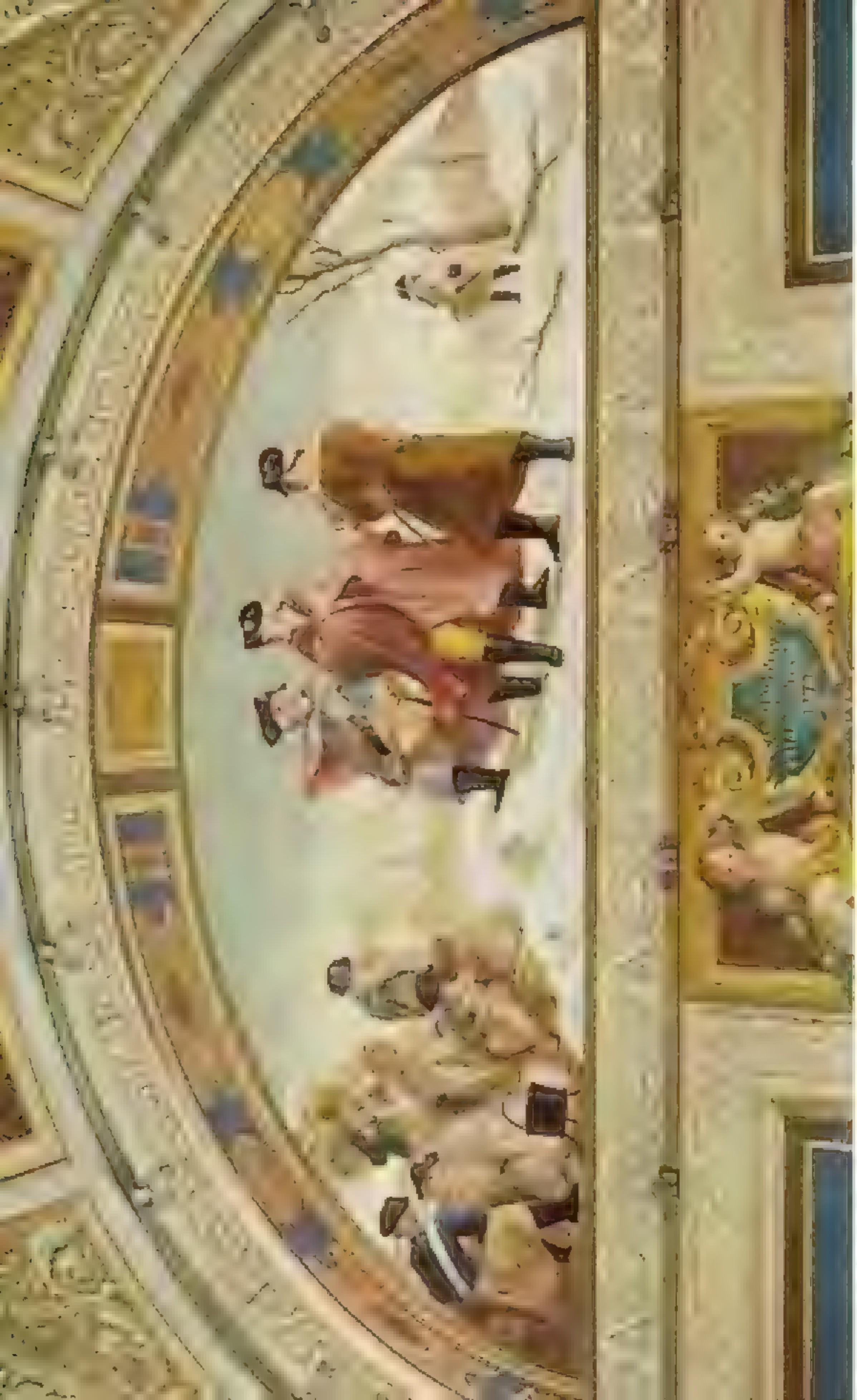
White Lotus Festival
The Beginning and
The End of the Year

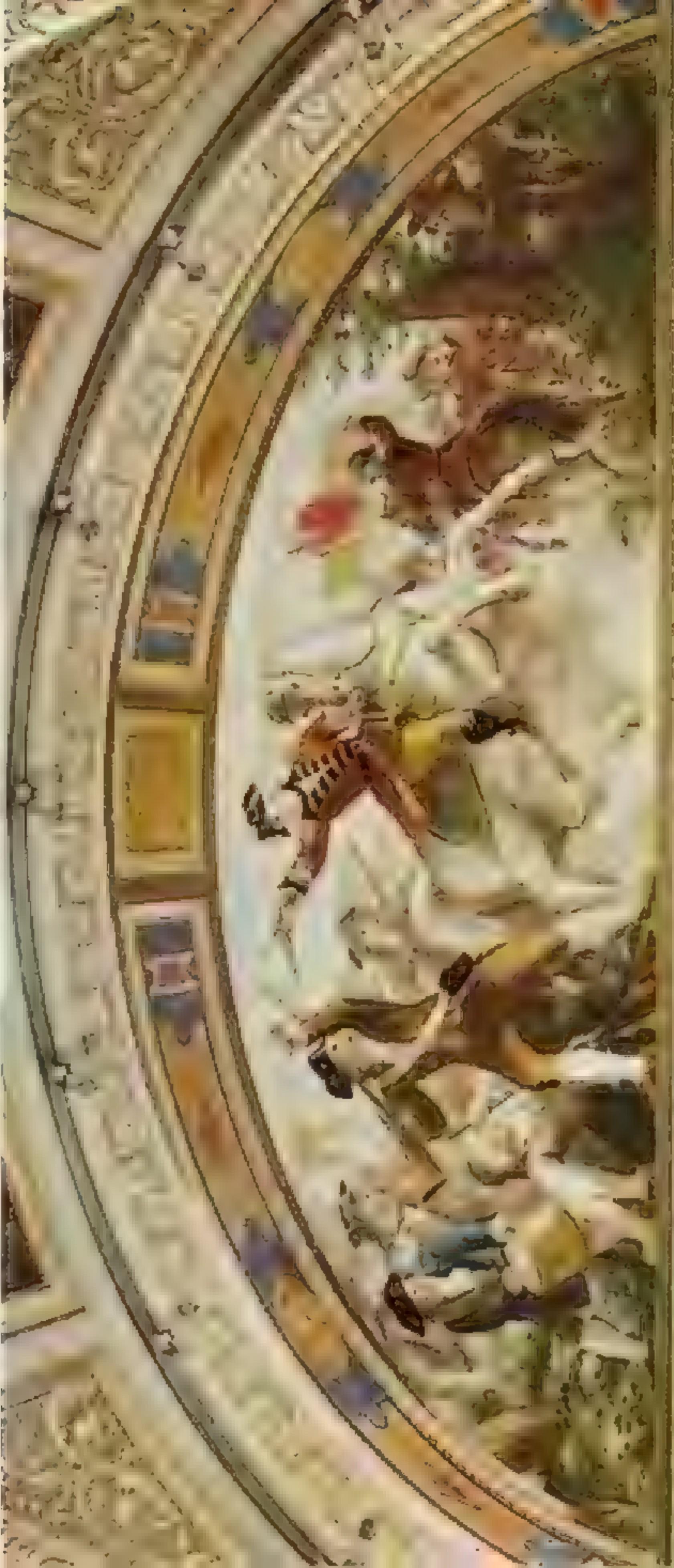
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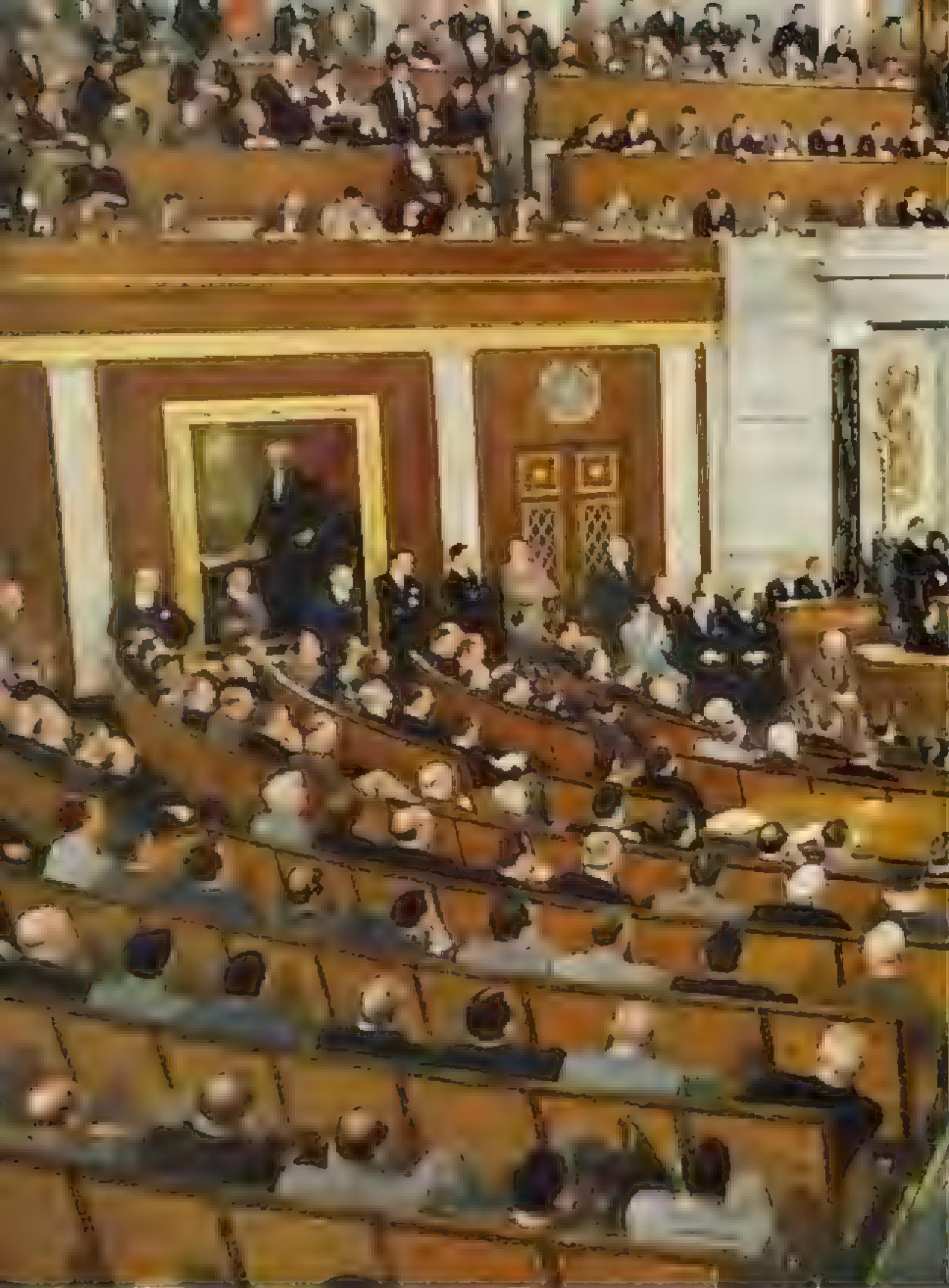
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Constantine Brumidi's "Winter in Italy with Wind and Weather" on the ceiling of the U.S. Capitol Rotunda.

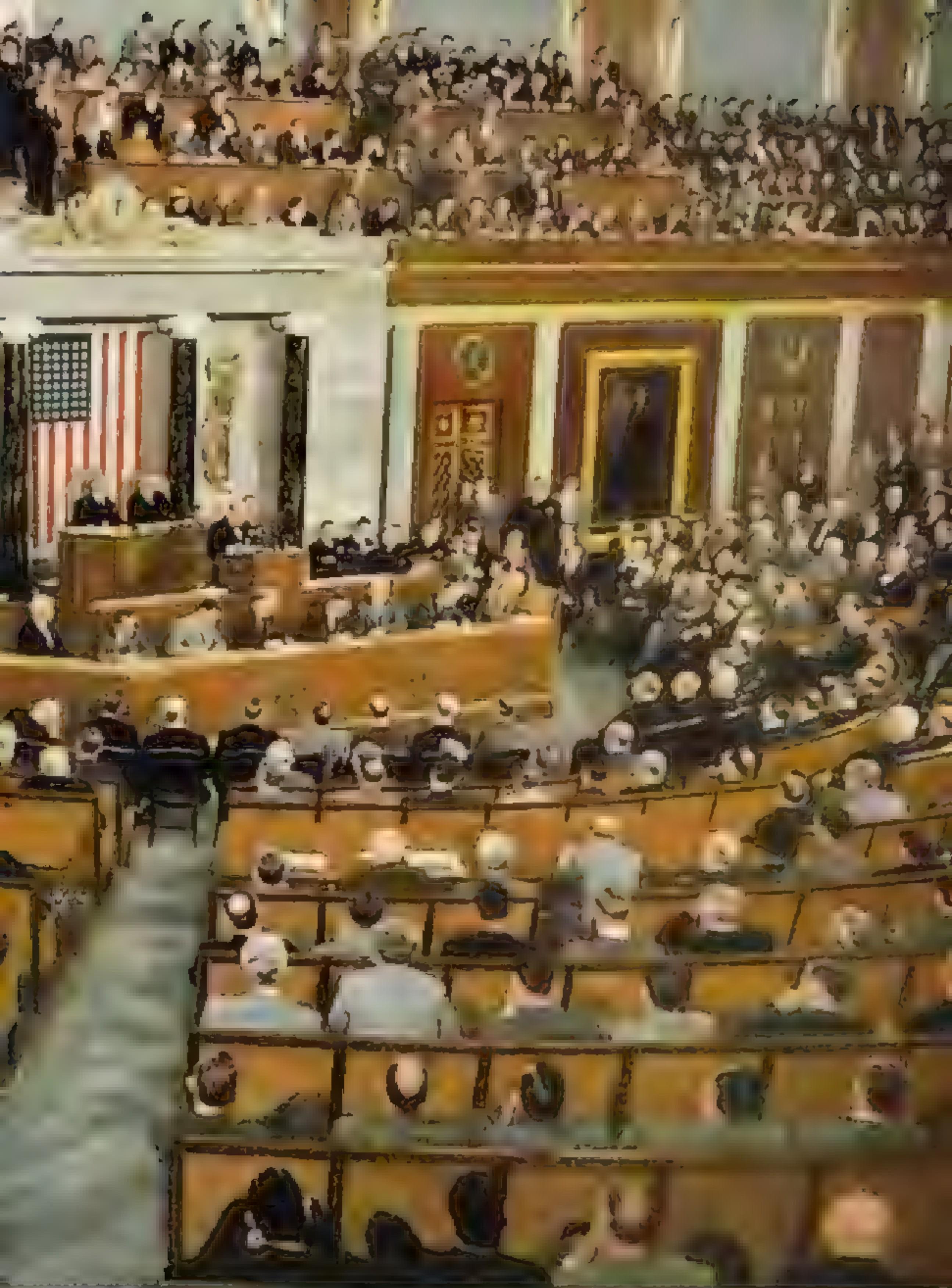






Lawmakers, Press, and Visitors Crowd the House Chamber for a Joint Meeting

On the floor of the House chamber, Collected here to consider the proposed bill to prohibit the manufacture of beer and wine. Portion of the Washington Times photo.



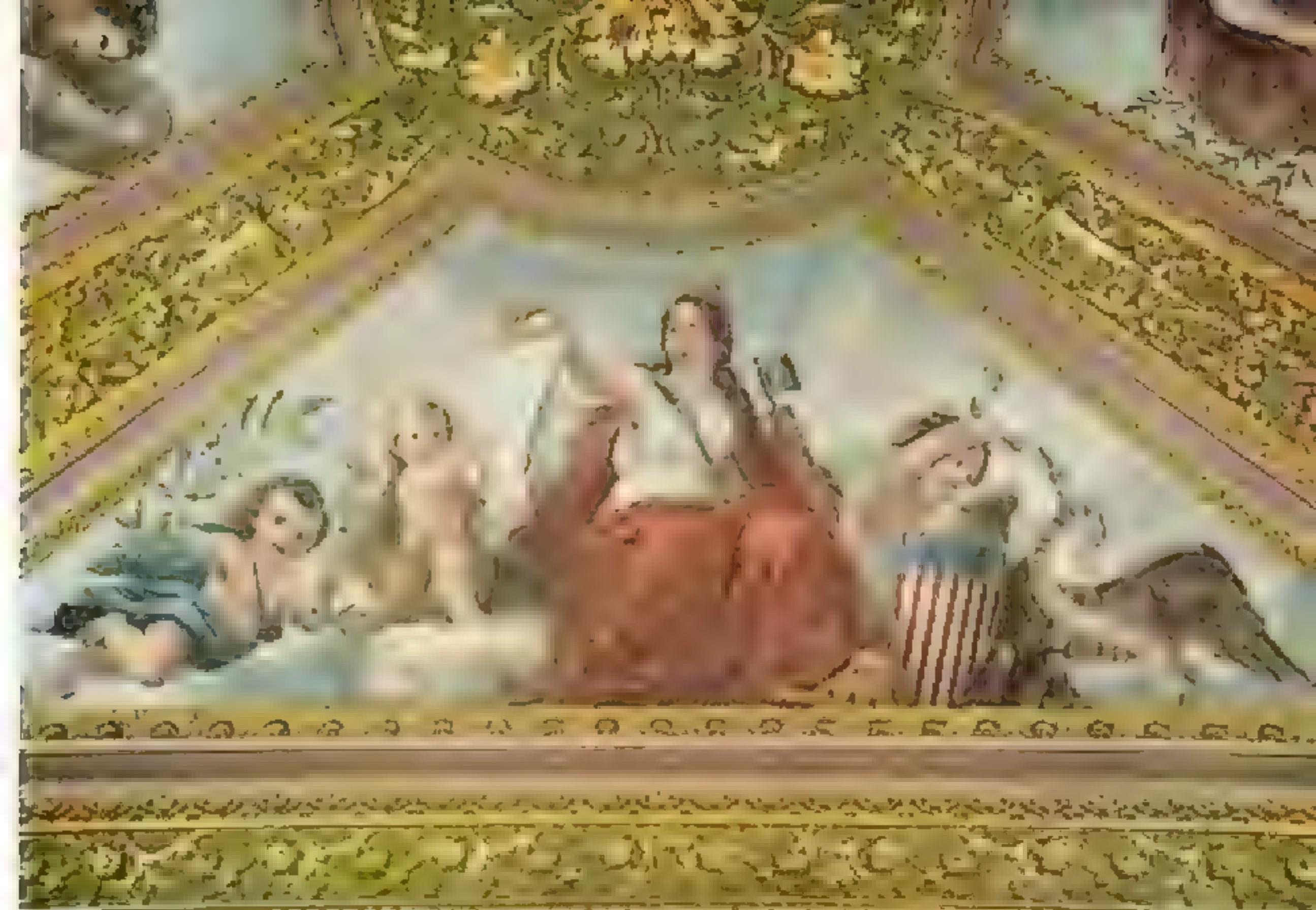
British's Winston Churchill Addresses the U. S. Congress for the Third Time

On January 5, 1946, the Prime Minister of Great Britain returned to the United States to speak before both houses of Congress. His purpose was to call attention to the need for continued support of the British Commonwealth and to assure the American people that Britain would never again be compelled to depend upon the United States for its defense.

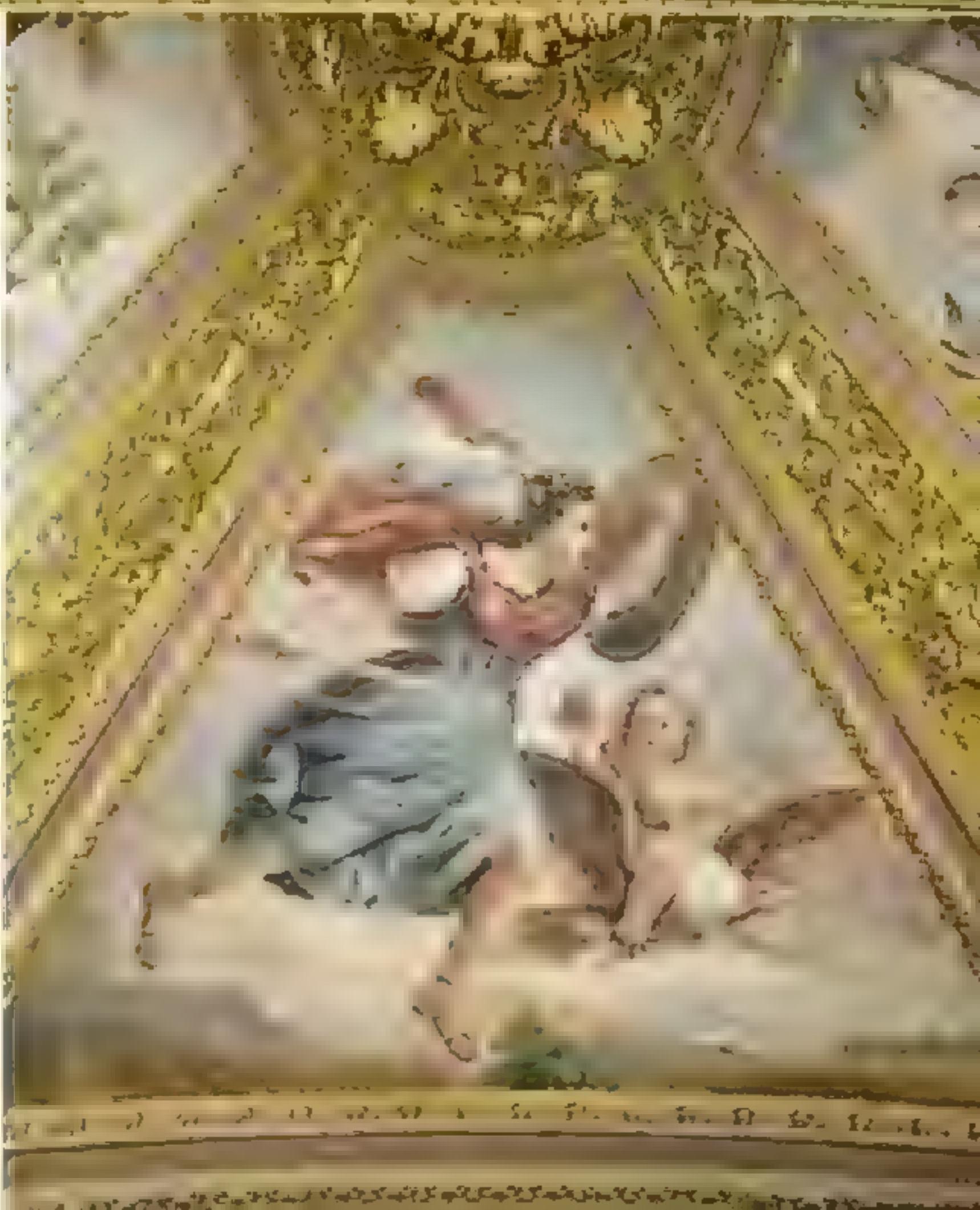


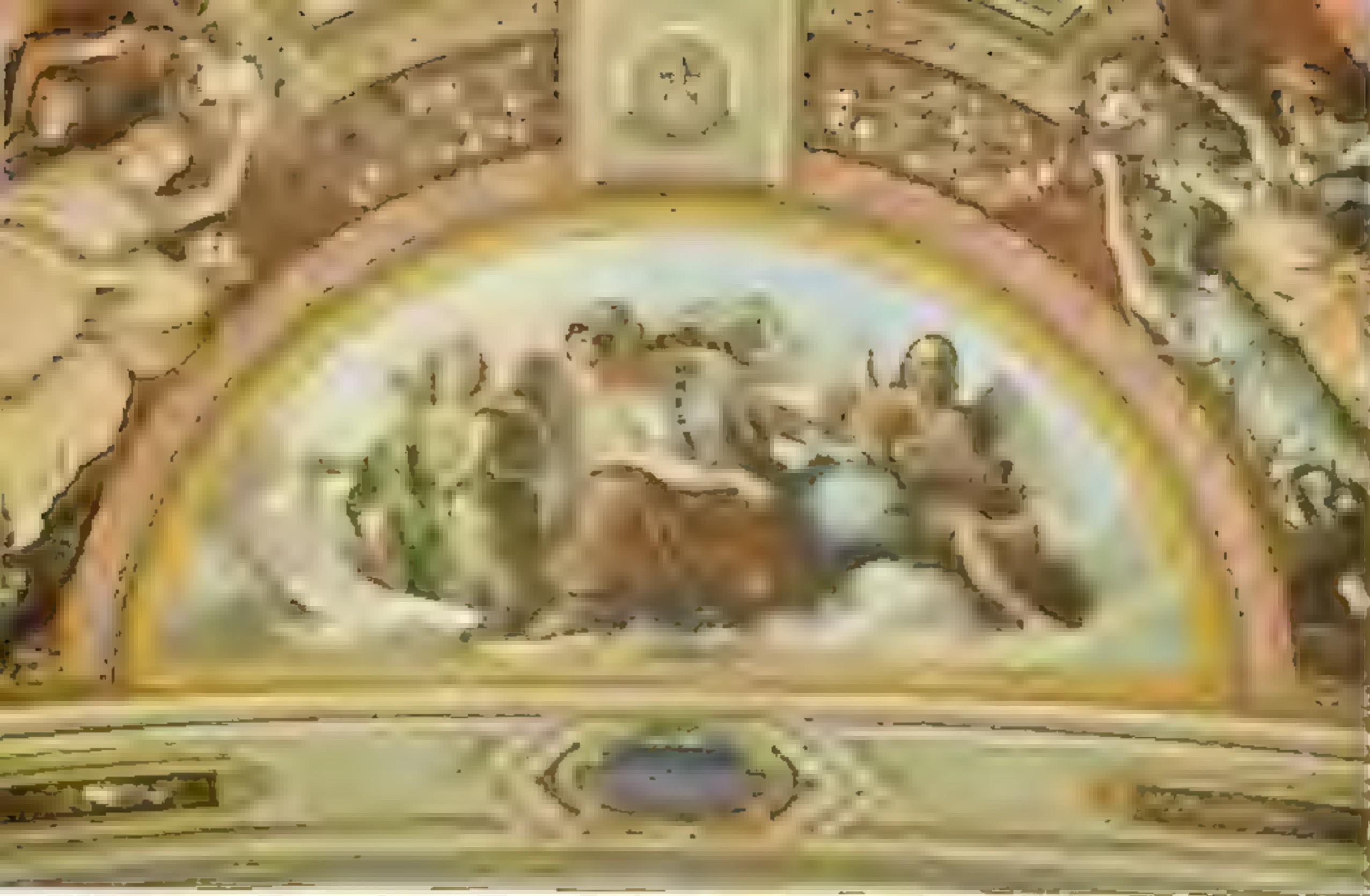
Cherubs Playing above the Crystal Chandelier in the Senate Reception Room

Painted by James Hartman, 1901. The original oil painting is located in the U.S. Capitol, Washington, D.C.



The Great Party and Scavenging War Deals a Brutal Blow

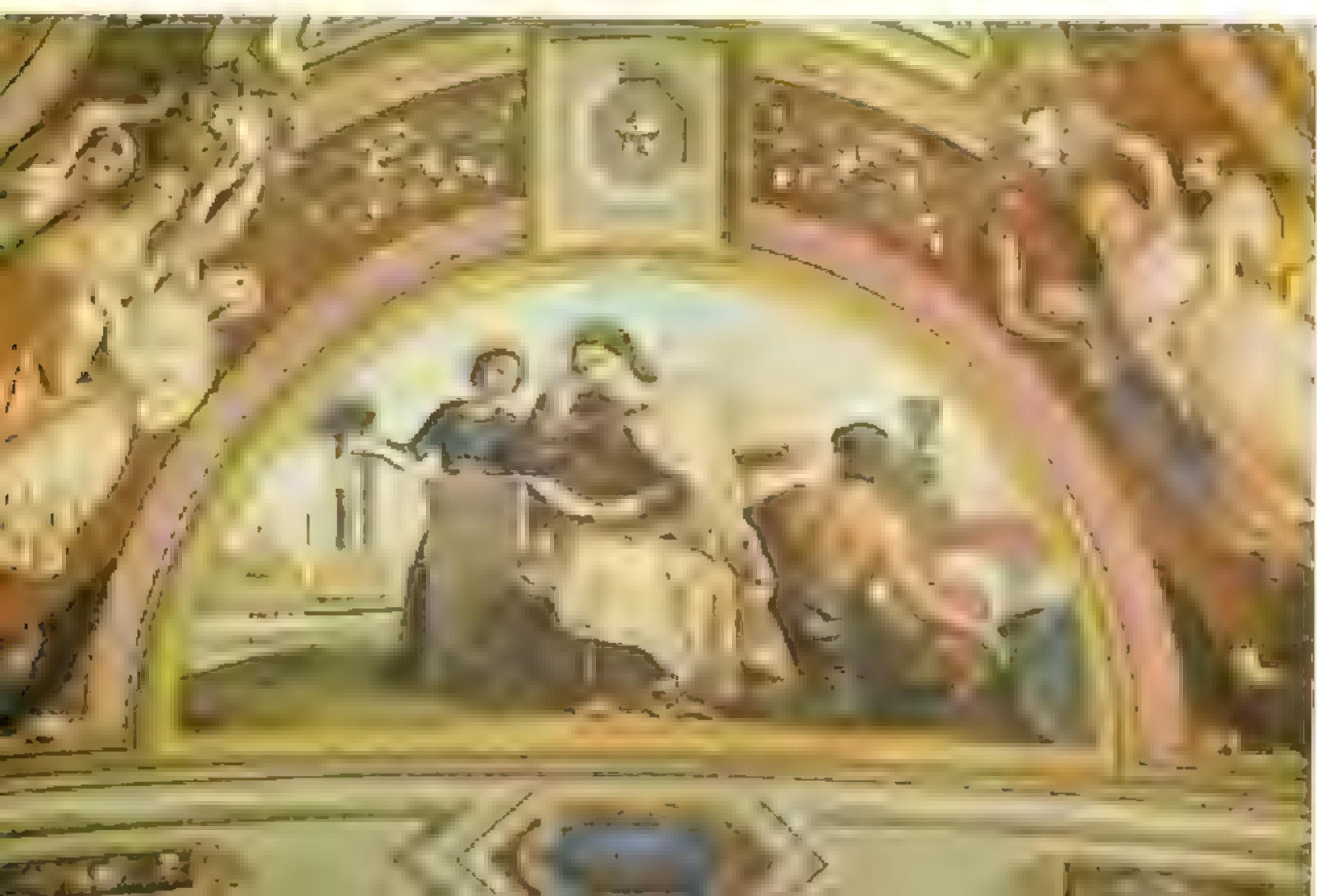




Geography and History Illuminate the Scenic District at Zhejiang River

The area where the garden is located is situated in the northern part of Hangzhou City, near the northern bank of the West Lake. It is a well-known scenic spot, famous for its beauty and historical significance. The garden was originally built during the Tang Dynasty, and has been renovated and expanded over the centuries.

The garden is surrounded by lush greenery and features several traditional Chinese buildings, including pavilions, temples, and courtyards. It is a popular destination for tourists and locals alike, offering a peaceful retreat from the hustle and bustle of city life.



At last came the hoisting of the Capitol's crowning statue, the giant goddess, Statue of Freedom, designed by the prolific and iconic native Thomas Crawford.

This nearly 20-foot figure, with flowing drapery, eagle-feathered helmet, and sheathed sword, is a saga in itself. Completed in Crawford's Rome studios in 1857, the unwieldy plaster model was eight months in reaching the United States, after a passage beset by storms, leeks, and other all-but-fatal sailing problems.

Wartime conditions further delayed the casting in bronze, and it was not until late in 1862 that the statue was set up temporarily on the Capitol Grounds for the public to view.

Guns Greet a Goddess

The triumphant raising of "Armed Liberty" in her lofty spot above the dome was accompanied by a significant bit of power display. As the head piece slid into place at high noon, December 2, 1863, the American flag was unfurled, a 35-gun salute boomed out from the grounds, and in turn an iron-throated answer was roared by cannon from 12 of the forts then encircling Washington.

The Capitol, as we now see it, was finished then. But huge office space unmet were still to come, as congressional needs expanded. The House Office Buildings were completed in 1909 and 1933. The Senate Office Building was occupied in 1909, and four years later was linked to the Capitol by means of that treasured convenience—the Senate subway, popularly known as the "Tunneyville Trolley" (page 169).

Even yet, some say, the Capitol itself is incomplete. In the room below the Rotunda—~~the dome~~—is a 120-ton model built in 1903-04 to illustrate proposals for an extension of the building's central west front (page 172).

The project was never carried out, though periodically the subject breaks into the headlines. Those who oppose the change say the Capitol should be left the way it is, as a historical monument. Others, including President Truman, argue strenuously for the extension.

Architects wholeheartedly agree that the addition would correct the false impression of lack of dome support, add space to the building, and, moreover, provide an opportunity to replace the old sandstone center with marble to match the wings.

You can imagine what a tremendous job is involved in the basic care and upkeep of the Capitol when you consider such staggering statistics as these: 14 acres of floor space, 11 elevators, 450 rooms, and 679 windows.

Whenever the way has been cleared by congressional recess, battalions of extra cleaners,

painters, carpenters, repairmen, and other skilled and unskilled workers join the "regulars." They swarm over the building on assignments that may range from painting the big dome (1,000 gallons every four years), to polishing each tiny pendant of mammoth crystal chandeliers (page 179).

In addition, the Capitol's art treasures call for special attention.

The Lady Who Irons Paintings

I came on a curious sight in the Rotunda one day. Trumbull's huge painting, "The Surrender of General Burgoyne," was out of place. Its empty frame resting on the floor and attached to ropes suspended from a balcony high in the dome. The picture lay face down on a platform built to size, while a small blue-skinned woman went over its surface with an electric iron (page 149).

The ironer, I learned, was an artist from Vienna, working for a Washington art store which is under contract to freshen and repair three of the Rotunda's eight historic paintings. The warm iron was taking up excess wax so that a new protective packing could be applied to the canvas.

A small patch caught my eye. "Is that the spot," I asked, "where some vandal cut a hole in Daniel Morgan's boot?"

"No," came the answer, "That's where a work man's ladder slipped. But someone did slash a big piece out of the 'Battle of Lake Erie' on the Senate east stairway. Look closely and you can see where it was mended" (page 158).

Now and then the problems of Capitol upkeep go far below the surface to basic and structural needs.

"Last year we finished the biggest job undertaken since they built the dome," Architect Lyon told me when I visited him in his high-vaulted groined-arch room. "That was the reconstruction of Senate and House Chambers and roofs."

Both legislative halls now have new, solid roofs in place of the dangerous and defective old ones with their stinging glass and iron skylights. Ceilings of stainless steel and plaster, with soft, indirect lighting, have replaced the unsightly crisscross supports put up in 1940 to protect the lawmakers from then perilously sagging surfaces.

The two Chambers have been redecorated in different colors—Senate red and gold, House blue—and given improved acoustics and air conditioning. Additional provision has been made for radio and television pickup. In the House, rows upon rows of comfortable leather chairs have been substituted for the odd "lecture seats" (pages 162-163).

Only a few relics remain. In fact, to link



The Great Dome Was But Air When the Crowd Gathered for Lincoln's First Inaugural

BY ROBERT COLEMAN
With the exception of the dome, the present building was but air when the crowd gathered on the steps of the old capitol to witness the first inauguration of Abraham Lincoln. Even it was raised to a peak of 200 feet.

It was with the tradition of other years. Among them in the old capitol, and with Lincoln, were some who believed that he could not be elected, and others fearing that he would not be inaugurated.

On all the capital buildings, however, was the same sense of doubt. The reconstruction period of the country was misgoverned by Congressmen known for their violent revival of interest in the antebellum Federal artist who fled to New York to avoid political persecution (pages 10-11 and 118-119).

September 18, 1852 will mark the date of the arrival of Brunelleschi sailing into New York Harbor. His companion, Bernini, had died two years earlier, but with him the Capitoline hill was but a hill of air (page 17).

Then it was the painter who (Bunni) began to paint in color, but his adding a few years after his arrival, that he added to his signature the title, "Painter of the U. S.

He Painted for Freedom

Bunni had acquired U. S. citizenship as soon as possible. Characteristically, he said his future here in these words: "My one ambition and my only purpose is to make the United States a great nation like the Empire of the sun, in every way." In which there is no doubt.

The work in the Capitol has not yet been completed. The Bramante porticoes and towers, 100 millions and upwards stand out in splashes of vivid color on immovable ceilings and wal-

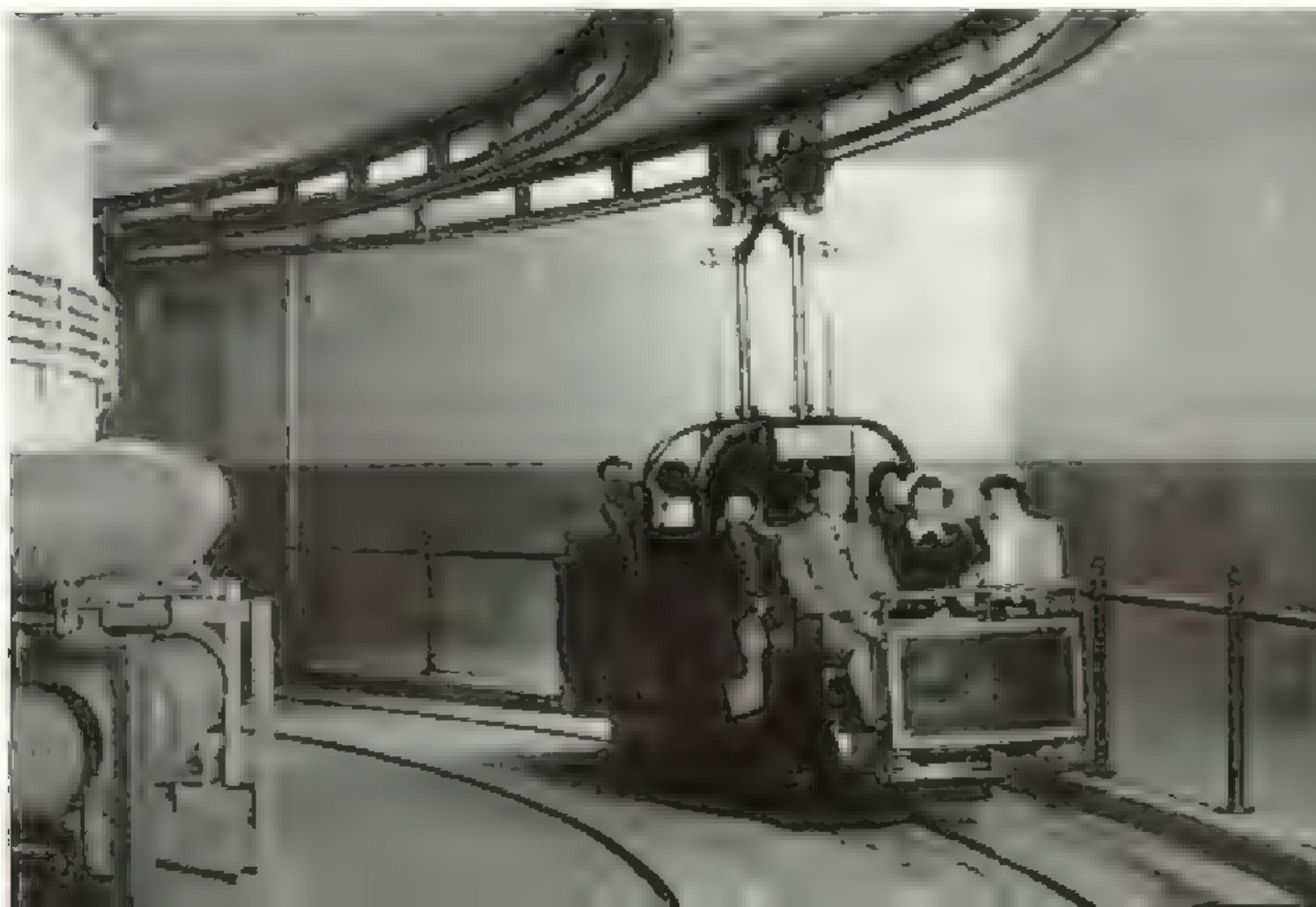


* Senators Wear of Formal Escape to Their Private Lobby

SENATORS OF THE UNITED STATES IN NEW YORK CITY DURING THE WEEK OF MAY 10-14, 1937, FOUND IT CONVENIENT TO USE THE CARS OF THE LINCOLN MOTOR CO. FOR A RIDE TO THEIR PRIVATE LOBBY.

* Anyone May Go for a Ride in the Senate Subway

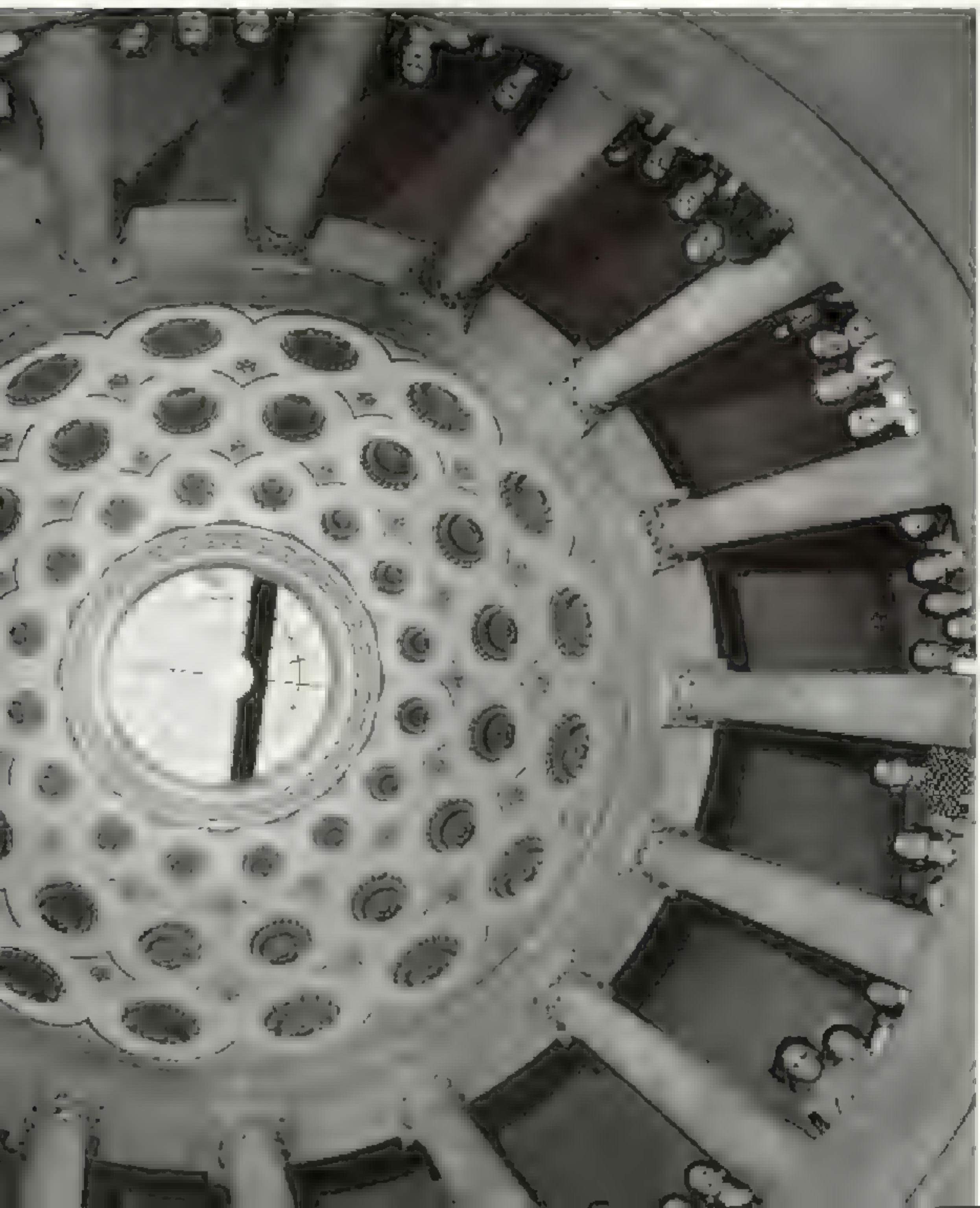
THE SUBWAY SYSTEM OF THE CITY OF NEW YORK IS ONE OF THE LARGEST IN THE WORLD. AND IT IS ONE OF THE MOST EXPENSIVE. THE COST OF THE SYSTEM WAS \$1,000,000,000.00. IT WAS BUILT BY THE NEW YORK CITY GOVERNMENT. IT IS MAINTAINED BY THE NEW YORK CITY GOVERNMENT.



Victory in a Small World

Everyone has heard of the
old adage that the best
way to get ahead is to
climb the ladder of success.
But what if you're stuck
at the bottom? What if you
have no connections or
resources? What if you
feel like you're drowning
in a sea of competition?
Well, there's still hope.
There's a way to succeed
even if you're in a small
world. It's called "Victory
in a Small World".

Victory in a Small World



Concerning Wicandres and questions he had a review before the Senate of Caesar's provinces, in winter.
Till now he had been in Gaul, and had not yet seen the Roman legions, nor
had he heard of their discipline and valour; and he was desirous to see them, and to know what they were.



V. M. Admire, L.L.D.
President 4. Class
Virtues & Virtues

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92. Truth — Truth
93. Truth — Truth
94. Truth — Truth
95. Truth — Truth
96. Truth — Truth
97. Truth — Truth
98. Truth — Truth
99. Truth — Truth
100. Truth — Truth



The Public Seats
This View Shows
States and Islands
in the Line of the Ship



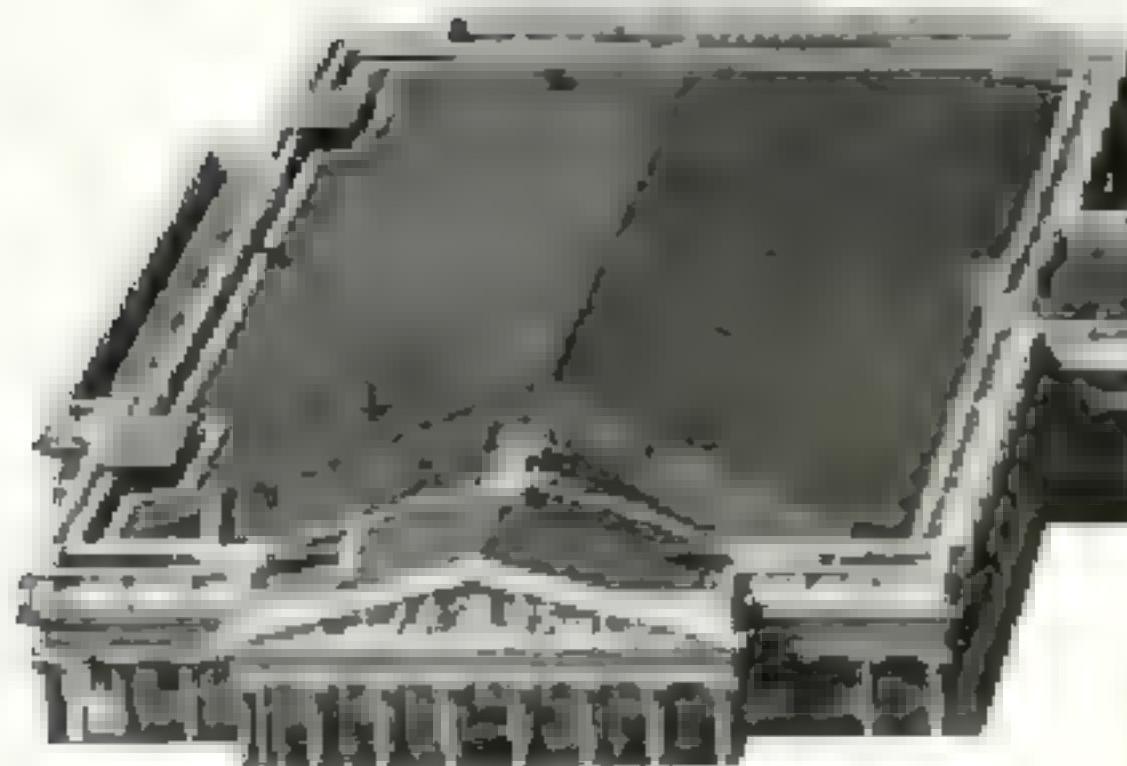
SOUTH

Lanterns glow when
House holds night
sessions.

Steep steps wide enough
for the two iron beds to
roll out gallery under
statue of Freedom.

Here the House sits the
ground floor above and
open to the sky when
it holds its first meeting
at 11 p.m. March 4, 1789.

The extension was
made by Representatives
John C. Calhoun
and Madison. It connects
Senate wing with the
House wing solidly in
one of many old rooms
with skylights.

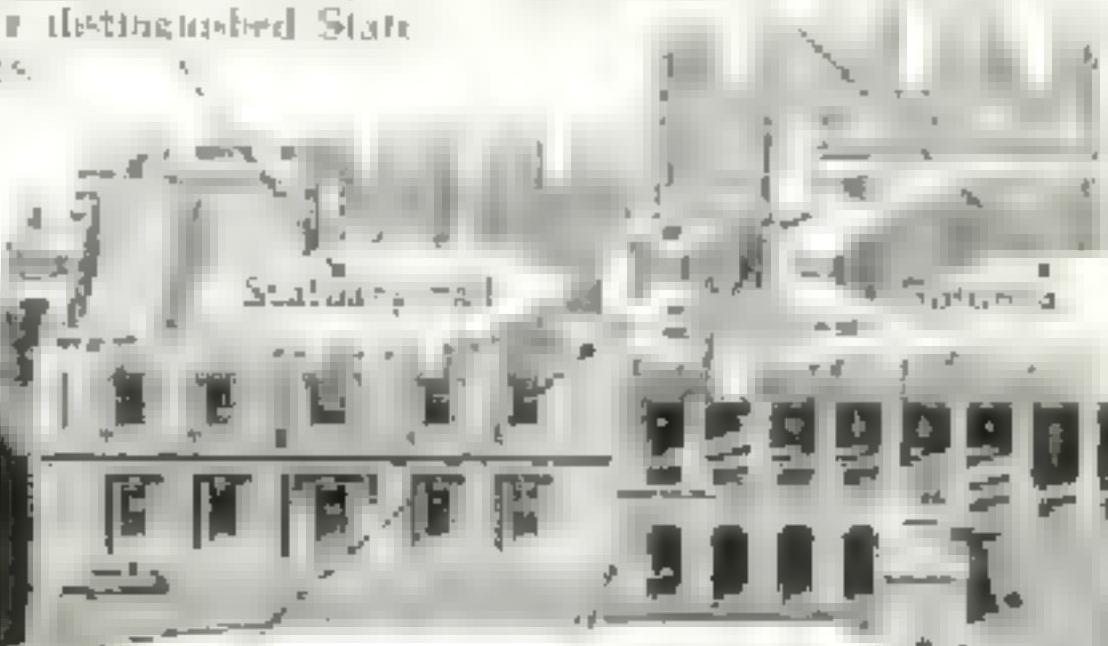


Speakers Lobby: Portraits of 42 Speakers, starting with F. A. C. Muhlenberg of the 1st Congress.

House west wing stairs
way to press. Painting
Westward Ho, "Home or
Else Take It West."

In House's old south
wing—Speaker's gallery
of Capitol—Rep. John
Calhoun in 1803. In
1804. After a seven-year
interlude of novels,
apple cores, and buckwheat
meeting space — same
Speaker's Hall, to
hear distinguished State
officers.

Recently decorated with
fables and parables in
the high. These artist
Carrollton, Ga., who was
working on fresco 58 feet
up when he slipped and al-
most fell. He died last
Friday at 77 in the studio.



Left: Speaker's
gallery. Right:
hands statues of George
Clinton (New York),
Stephen F. Austin (Texas)
and J. P. G. Muhlenberg
(Pennsylvania).



House east wing stairs
way to visitors and press
galleries. Painting, "Sign-
ing of the Constitution."

Two red barrels gleam
when House is in session.

Chair of Clerk of the
House, where John Quincy
Adams used to sit. Behind
is a desk on House floor.

Paintings from Presidents
and their First Ladies
hang in the House wing
and galleries. From left:
George Washington,
James Monroe, John
Quincy Adams, William
Howard Taft, Franklin D.
Roosevelt.

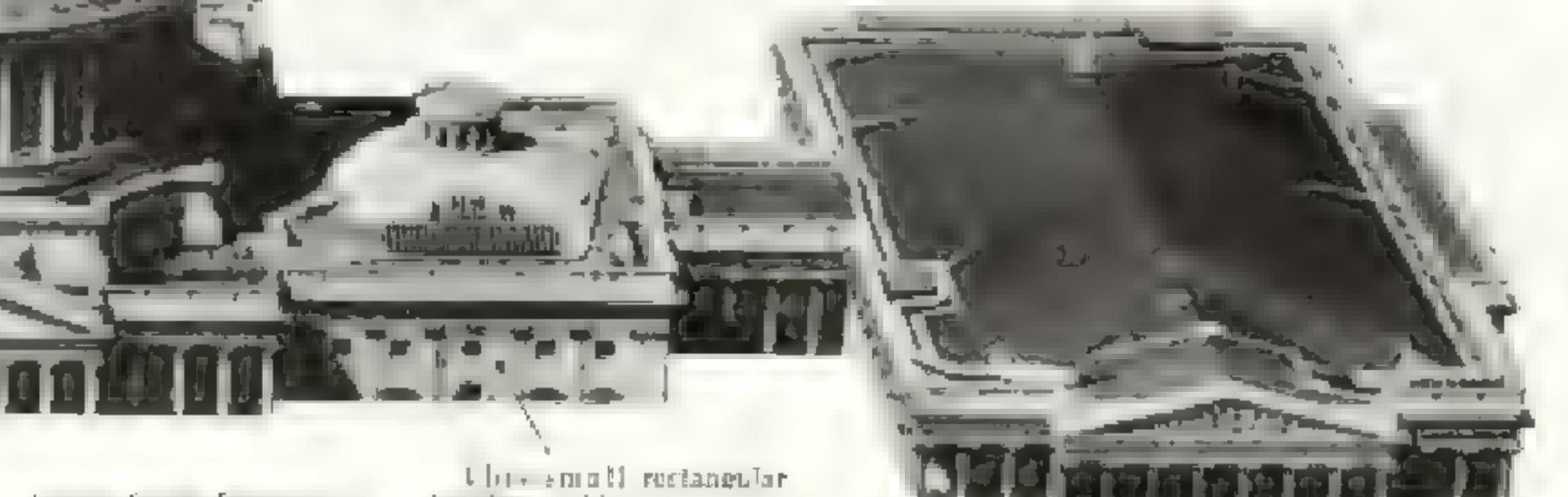
Former Status of the
Senate during Civil War
Under authority of the
States 13th from South
and 15th from North
and 16th from New
England. Total 287
Delegates. Total
Delegates 111. War

NORTH

Lincoln's "Weed Bed"
and his "Prairie Room"
from which he spoke
from the floor.

Large room of the
Senate to be built
either to permit expan-
sion and contraction. With
expansion it would be
very large.

Senate galleries were
rebuilt or enlarged Jan-
uary, 1859, in the shadow of
Civil War. During Recon-
struction era, the Chamber
witnessed the drama of the
impeachment trial of Pres-
ident Andrew Johnson.



Senate Room, 1800-1812,
was used as a library
and reading room and
as a Committee Room. Located
between the wings of the
Senate and House.

The small rectangular
building (old north wing) was
Capitol's first wing. Crowded here after the
Government moved from
Philadelphia in 1799, the
Senate and House, Supreme
Court, Library of Congress
and State and War De-
partments met here.

Senate wing was
used for Senate Party
Bills of Impeachment.

President's Room, richly
decorated, built especially
by Lincoln for sitting bills.



House wing, built
in 1800-1812, was
Washington's last com-
plete in 1793. Burned
down in 1811.

Former Senate Cham-
ber, 1800, later known
as the Court Room (1860-1935).
Senate here met below
the floor in an area 16 ft.
two stories high.

White Room played host
to a number of Presiden-
tial meetings, Executive
sessions.

Senate chamber stat-
uary visitors' and press
galleries. Painting on hand-
ing - Battle of Rose Ene-

John C. Calhoun
Atomic Energy. His last
speeches were in the
Senate in 1850 and his
famous message "What
bless God wrought."

Mattie Room, finished
with Tennessee, Vermont
and Italian marble as Sen-
ate's Reading Room.

Marble Room, finished
with Tennessee, Vermont
and Italian marble as Sen-
ate's Reading Room.

The Capitol Covers 3½ Acres. It Grew by Bits and Pieces from 1793 to 1863.



A Bonanza - A Must in Seeds' Net

With the arrival of the modern
power generation system, the Agip
gasoline production facilities were
modernized and expanded.
In 1958, the first 100,000-ton
ethylene plant was started up.
In 1962, the first 100,000-ton
propylene plant was started up.
In 1965, the first 100,000-ton
butadiene plant was started up.
In 1967, the first 100,000-ton
isobutylene plant was started up.
In 1970, the first 100,000-ton
butyl acrylate plant was started up.

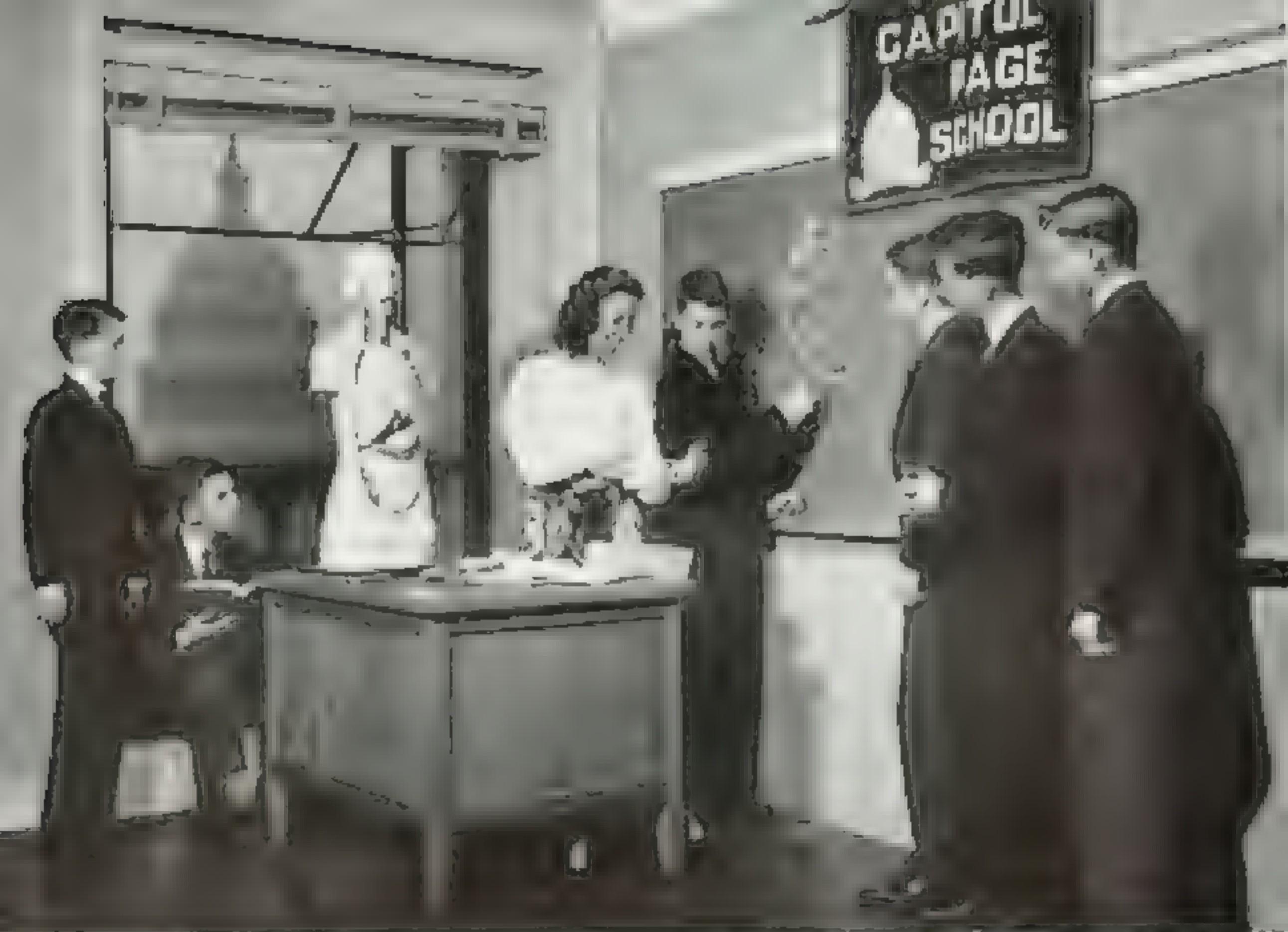
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**Senator Francis Case
States Interim Bill
to Constituents**

and the people have
the best of times.
They have the opportunity
to buy what they want
and to sell what they
have to others. They have
more money than ever before,
but they do not know
what to do with it.

$\frac{d}{dt} \mathbf{r}_1 = \mathbf{v}_1$





Congressional Pages Must Learn Their Lessons Before They Run Errands

On Aug. 25 the 11-year-old congressional page corps presented and other congressional pages were invited to a special session of the Senate to hear the annual report of the Senate Select Committee on Ethics.

Next day it was up to the congressional pages to give a short report on the Senate's suspended operation. In their 15-minute speech they will make all their excuses for the return of part of the Congress to Washington.

Starting in 1865, learned depended largely on his mother and his brothers. He continued to do his share in the creation of the federal codes that became the compass of the law way before he took up his pen during the Civil War.

Like most of us, we were the firm's partners in accomplishment through the medium of telephone. The author uses a Michelangelo's god in depicting the State Capitol as the American. Lincoln himself had worked on American recordings.

This is an effort that is extremely interesting. It is a re-painting of the old law library, which has been decorated with water. It is a restoration, not a new painting. The work has to be removed and start again.

A stand-breathless silence is the report of the author on the highest memory of the Kennedy and Johnson administration. The press. Nearly the first news story people talked

about when Lincoln died was Lincoln's deathbed.

It seems inevitable that the author's claim, however modest, that Lincoln could have roared like a lion in his last days, was strong with readers of his time, and may even put his designs far and out of the reach of front-line critics.

Recognition Long Delayed

Actually, Lincoln gave no tribute to the Kansan in writing. He was 70 years old when he died, on the road to his home from Illinois. He does not say when he got the upper cut, nor when he got the lower cut, but he does say that he got them. He managed to get a copy of "Walt Whitman's Leaves of Grass" and took the manuscript straight to the West Wing of the White House, where he was received.

On Wednesday, Oct. 2, 1909, at 10:30 a.m., spring flowers were scattered on the floor of the U.S. Capitol, a story was told about Lincoln and his family, and the author spoke.

A small audience was gathered there for the arrival of a young page boy.



Painters Brighten and Repair the Capitol's Decorated Halls

BY ROBERT L. COOPER [With photographs by James M. McWilliams]

For the first time in more than 10 years, the interior of the U.S. Capitol has been repainted. The work, which began in January, will be completed in early May. The cost of the project is \$1.5 million.

The painting of the halls and rooms of the Capitol is a complex task. It requires the use of special equipment and techniques to reach high ceilings and tight corners. The work is done by hand, using a combination of paint and varnish.

The painting of the Capitol's interior has been a tradition since the early days of the nation. The first major painting project was completed in 1803, and since then, the interior has been repainted every few years.

* Something's Always Breaking Down; Repairsmen Keep Busy

The Capitol's facilities are constantly being repaired and maintained. The work is done by a team of skilled workers who are responsible for keeping the building in good condition.

The repair work includes everything from repairing broken windows to fixing leaky roofs. The workers are highly trained and experienced, and they take great pride in their work.





Reporters Take a Full Service News Break on Capitol Hill

More than a dozen newsmen and cameramen were on hand at the Senate office building yesterday to cover the White Death of Sen. George W. Norris.

Mostly from newspapers in the state, Senator Norris' death was the subject of in House of Representatives and in the Senate of the House was on him.

But Pressmen turned out in force with cameras and microphones and were in and out of the Senate chamber to record the arrival of the body to the Capitol and the services to be held there.

Meanwhile, Mrs. John R. Mendenhall, widow of the Lincoln pottery manufacturer, had arrived to the Capitol early Saturday morning to care for her husband's body before his return.

A plain casket covered with a white cloth lay in the lower floor of the Senate office building, and the cameras and microphones of the reporters were equipped to record the arrival of the president.

The press reception for the wife of the late Mr. Mendenhall, before the funeral services, was one of the most touching of his life, an audience of long-standing.

Every day for months, she had been the better-attired figure in Washington, kept company with others. On May 14, 1940, she was passing the Senate office building when a press girl came up and asked what she was doing.

"I am here to be a good grandchild," she said, "and help my mother. I am German," she added, "but I am married to an Englishman and I live in England and have to go there."

With the news already provided them, this time the press left her alone. Mrs. Mendenhall was equal to the task. She had a large, Spanish-style house on the United States Capitol grounds, where the press brought their cameras before the traditional honor at the grave of George Washington is the lady who, during the ceremony

Speaker Sam Rayburn gave her full credit for the Nation's first acknowledgment of its debt to this "Citizen of the U. S."

But there is still one bit of unfinished Brumidi business at the Capitol. Today's visitors to the Rotunda often look up curiously at an uncompleted portion of the enchanting frieze.

Soon after Brumidi's death, Congress engaged a second fresco artist, Filippo Costaggini, to carry out the half accomplished work, using Brumidi's original designs. This the artist did, but in the execution he squeezed his predecessor's panels and figures so that there was left the additional scenes of his own.

Congress rejected the suggested additions. Years later, still a third artist failed in part in the space, but the work was judged unsatisfactory. It is soon to be replaced by three scenes, for which Congress voted \$20,000 in 1951. The subjects will be the "Civil War," "Spanish-American War," and the "Birth of Aviation in the United States."

Millions Tour Their Capitol

About a quarter of a million visitors every year take the official paid tour conducted by the Capitol Guide Service. Other unrecorded scores of thousands come in to wander around for themselves, to see their Congressman, or to consult the building personnel on business of one sort or another.

"Our best season is during the spring holidays," said Harry Nash, dean of the guides,

who in 37 years of service has probably greeted more people than anybody else in Washington. "But we never have what you might call really slack spots in this business."

At all times of day I met the visitors tramping the long corridors alone or in groups,

serious-looking middle-aged couples, sweethearts holding hands, and many children.

"Look, Daddy," I heard a little girl call out to her father as they inspected the Rotunda paintings. "The man has six toes!"

Sure enough, a seated Indian in John Chapman's "Baptism of Pocahontas" has an extra toe. Whether the artist was careless or purposely painted one of Nature's slips is hard to say.

The Capitol's professional guide system, designed to give visitors an explanation of the building's chief features, is now 76 years old. It was born out of the rear chaos which resulted when hordes of sight-seers moved on to Washington from the Philadelphia Centennial in the summer of 1876.

So in hours of traffic were inundating the Capitol, and pickpockets and confidence men were taking advantage of the situation.

To meet the twin problems, Congress appointed five guides to organize and oversee the

crowds while describing the Capitol's wonders. The service proved popular and slowly but steadily has grown through the years.

At present there are 24 guides, including 11 women. They are appointed equally by the House and Senate. Their pay comes from fees collected from sight-seers themselves—25 cents a head, with a 15-cent rate for school organizations. The price hasn't gone up yet.

Several marriages have developed from romances between the guides and their patrons.

I heard of a former Congressman who stayed on as a guide for 12 years. One of the girls inherited an appointment held by her mother. And only recently death took from the ranks the veteran son of charity and conscientious "Old Cap'n" Benjamin Cady, an original member of the service.

Sculptor of Pioneer Suffragists Now 105

By law all usual parties start in the Rotunda, go to the Senate wing; lower floor through the crypt; to the House gallery, and back to the Rotunda.

In practice, however, the trips are as varied as the personality of the guides. Each has her own technique and favorite stops.

An attention catcher in the crypt under the Rotunda is the group statue of three pioneer suffragists, Susan B. Anthony, Lucretia Mott, and Elizabeth Cady Stanton. This work has been abased, by the reverent,

"ladies in a bathtub," because it takes the form of three busts rising from a solid block of marble. It was carved by Adelaide Johnson, still living in Washington and planning to celebrate her 100th birthday in September.

"We find most visitors want to see their Congressman in action," said one of the guides. "So we notify Members when we can, and explain that absence doesn't mean the lawmakers are not on the job. Most congressional work is done, of course, in committee rooms and individual offices" (page 171).

Some of the questions asked by visitors show a woeful lack of accurate information on the Capitol.

"Does the President live here?" is a familiar one. Another went this way: "We've seen the House and Senate Chambers. Now where does Congress meet?"

The Floors: Visitors Keep Out

In the House side two red lights outside the legislative hall are lighted when the Members are in session. The Senate uses a white light for the purpose, with an adjoining red one which can be turned on as a warning of closed executive session.

Actually, officials tell you, it has been years since the doors to the galleries of either Chamber were closed to those wishing to observe.

'Floor' privileges, however, are jealously guarded. During sessions, only specifically designated outsiders—depending on Senate or House rules—are admitted. These include the President, Vice President, Supreme Court Justices, Cabinet officers, former Members of Congress, Members-elect—and those special persons who have by name "received the thanks of Congress."

The galleries that look down on congressional deliberations are divided into sections. Some are open to the public (when provided with easily obtainable passes); others are reserved for congressional families, diplomats, or accredited members of news services.

The story of the press and the Capitol is one of long-term struggle—with a happy ending. For this building now tills as a major and accessible news source for Washington and the world (page 180).

From the beginning, the public was generally permitted to watch the proceedings. Favoured guests, including ladies, once even sat on sofas and chairs put up on the floor.

Pies, Peanuts, and the Press

A few privileged newsmen, starting in 1801 with Jefferson's friend and protégé, Samuel Harrison Smith of the *National Intelligencer*, were given reporting facilities either on the floor or in the gallery.

One of the early correspondents of the *Intelligencer* was still further privileged. He shared the armchair of the presiding President of the Senate!

It was not until the 1840's, however, that the right of the press as a whole to cover Congress at work was recognized. Official action then came only after passionate debate and after firebrand James Gordon Bennett had published scathing attacks in his New York *Herald* against Senate restrictions on coverage.

Eventually, a committee elected by the newspapermen themselves was given jurisdiction, under congressionally prescribed rules, over the admittance of both-side reporters to the press galleries. This is now the accepted system.

But, meantime, accommodations were often uncertain and sometimes sharply limited. Back in 1850, Washington's *Evening Star* published an editorial complaining that new rules were holding the press "to the corridors, which for the most part are occupied with telegraph instruments, peanut stands, tramps, [sic] women, and lobbyists."

Today, well over a thousand men and women, representatives of newspapers, magazines, radio and television, are accredited to cover "the Hill," as the Capitol is called in popular parlance. They may sit in House and Senate galleries and use the extensive

working facilities provided in nearby offices.

Only about 200 of this news army are regularly on hand. When historic events are in the making, however, attendance jumps, and space must be carefully allocated. Such occasions in recent times have included three talks to joint meetings of Congress by British Prime Minister Winston Churchill (pages 162-163); the 1951 home-coming tour soldiers never tire speech of General of the Army Douglas MacArthur; and the address of Queen Juliana of the Netherlands in April of this year (page 145).

Many a tense and dramatic scene has been enacted before the galleries in both old and new halls of Congress.

Ex-President John Quincy Adams was suddenly stricken with paralysis in 1848 as he sat in the former House Chamber, now Statuary Hall. He died close by on a couch still preserved as a memorial in the room now used by the Clerk of the House.

In the old Senate wing, one of the most bizarre situations ever witnessed in the Capitol occurred during the impeachment trial, in 1805, of Supreme Court Justice Samuel Chase. In a most theatrical setting the Justice was acquitted.

Aaron Burr, the presiding officer, had provoked a commotion for crowds of spectators and had had the benches draped in scarlet in imitation of the scenes in Westminster Hall during England's sensational impeachment trial of Warren Hastings a decade before.

Stranger still, Vice President Burr, in solemn state above the proceedings, was himself under trial for murder at the time, as a result of the duel in which he had killed Alexander Hamilton.

Other high dramas played in the Chambers of Congress include the Senate's impeachment trial of President Andrew Johnson in the bitter post-Civil War days; and the April, 1917, address of Woodrow Wilson, made at the joint session in the House on the eve of the war declaration. That was the speech in which the President introduced his famous phrase "not making the world safe for democracy."

Isn't all the excitement in Congress takes place on the floor?

In the public gallery above the Senators one day in 1950, a veiled apparition in flowing

silken robes stood alone.

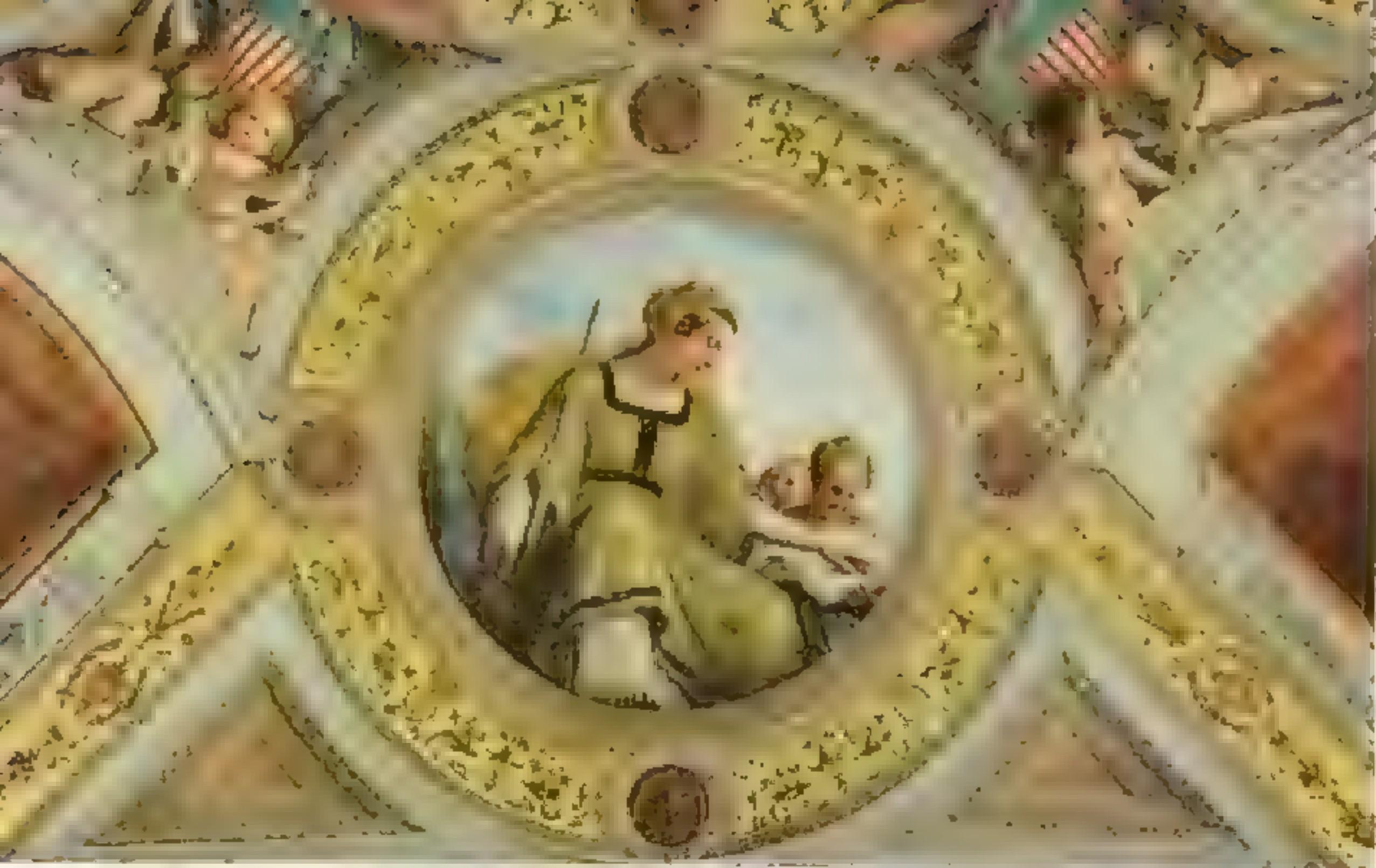
President's Room Captures Every Visitor's Attention

A gauzy curtain hangs above a mahogany table on which many Presidents have signed bills becoming law. Minton tile from England forms the floor's superb mosaic. From it's American Neo-Grecus looks down from the ceiling (water 144, p.). A bronze Reclining (in circular border) seems to follow visitors with her eyes.



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Scenes from the

Work Restoring the Nutman's Art Treasures Helped Give Braund the Classic Touch

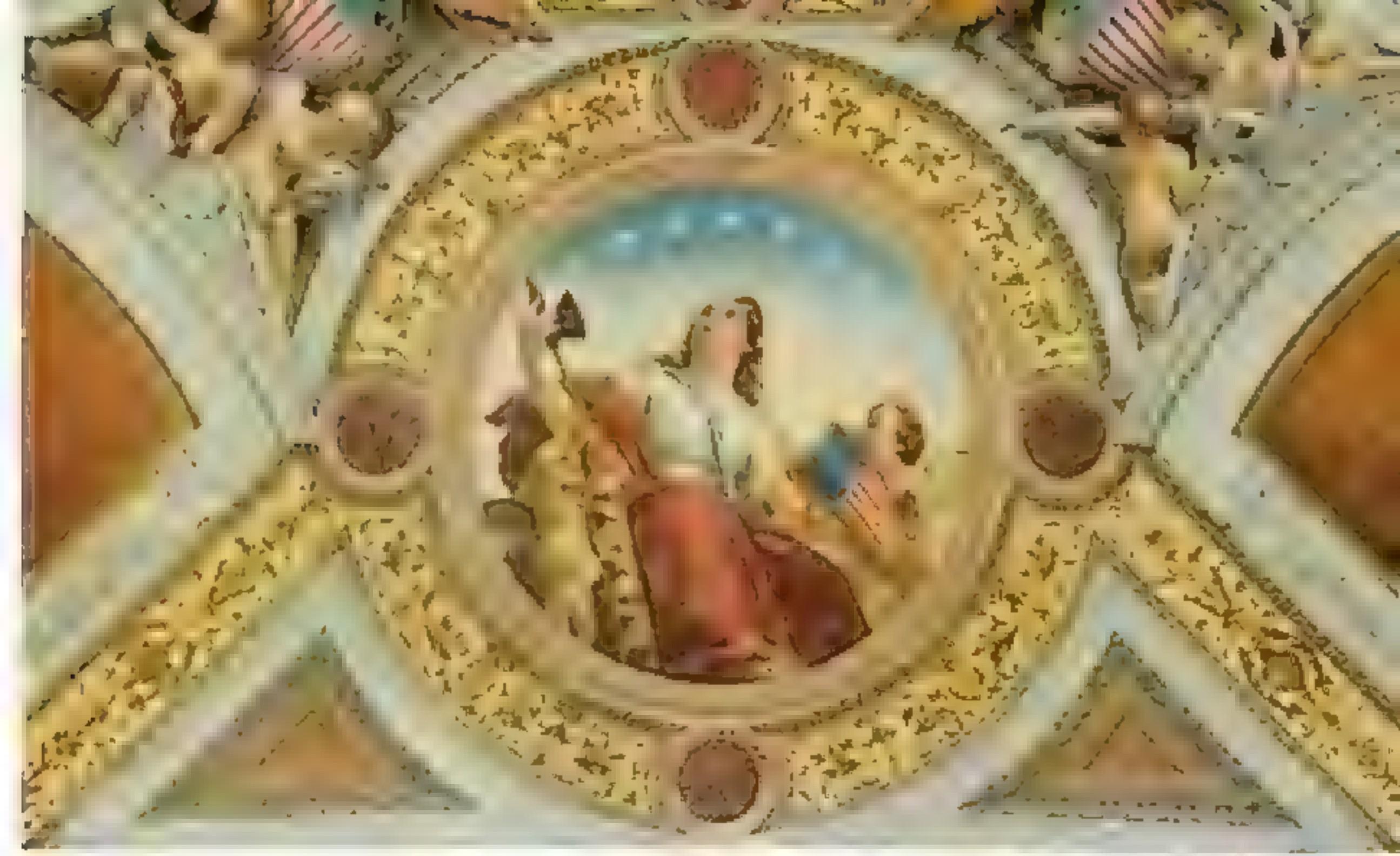
For more than half a century, the top U.S. restorer of fine art has been in Boston. Now, his son, John Braund, is carrying on his father's tradition of restoring the great works of art.

Braund, 30, began working in his father's studio of the old publishing center with painterly enthusiasm.

When he first started, he knew little and more than nothing about the art products he was restoring.

"I didn't know what I was doing," he says with a smile.





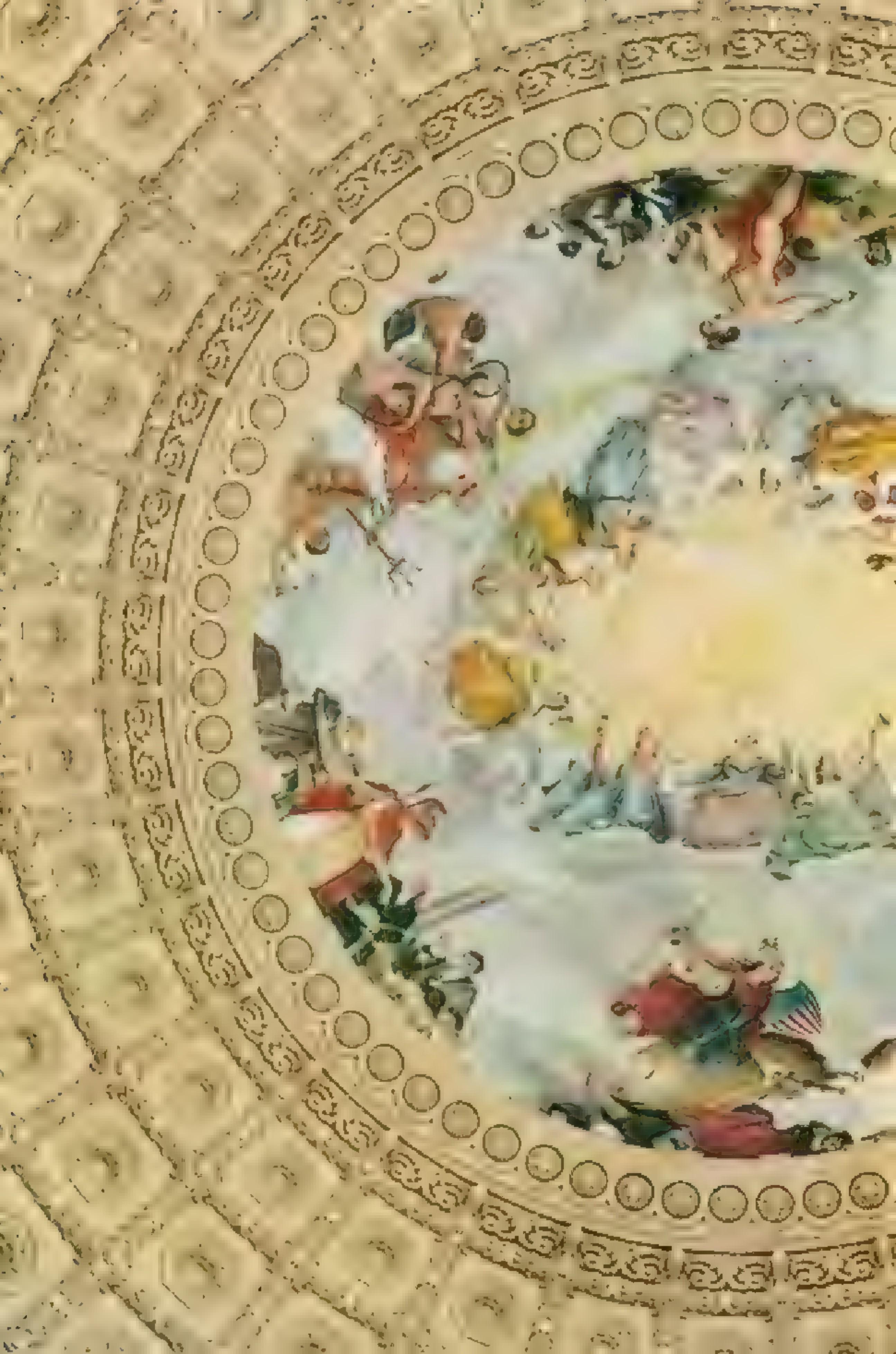
Aesop's Fables Franklin and Elder Brewster Represent Forces That Shaped America

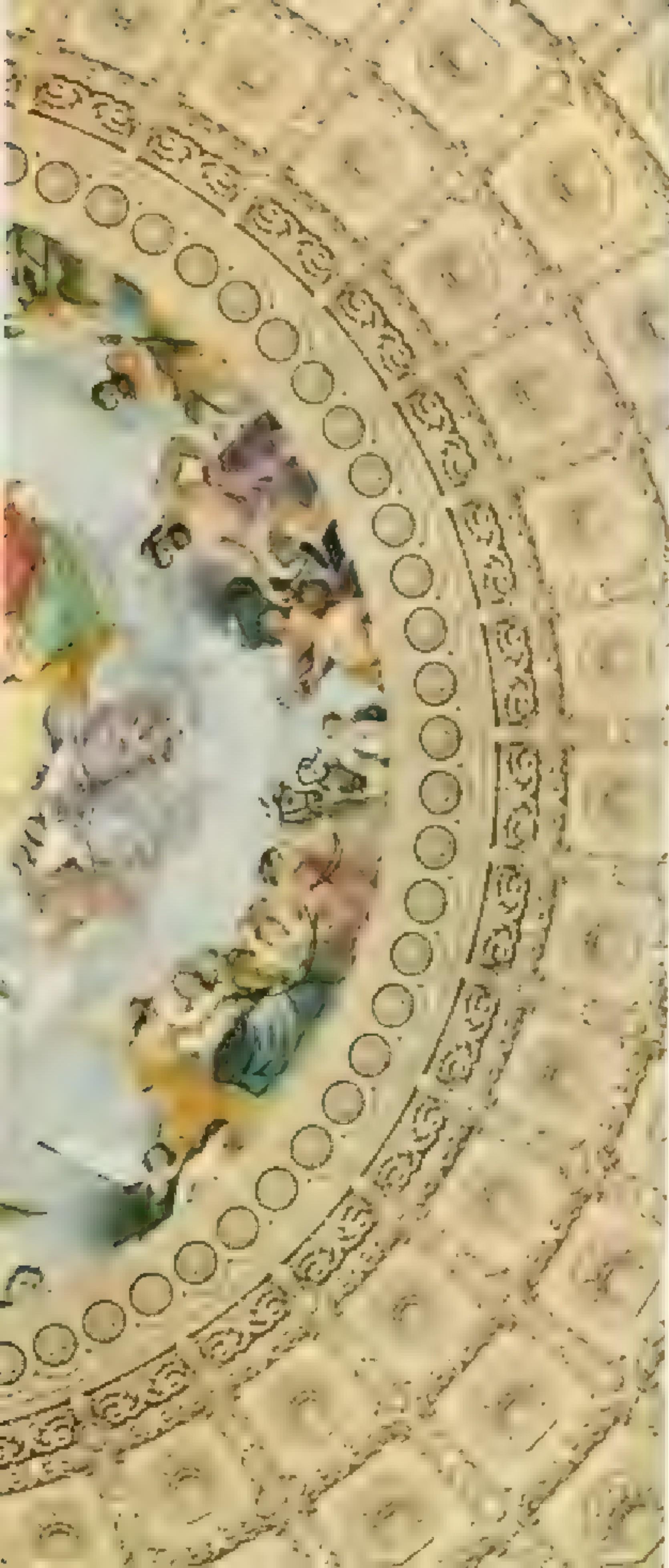
International Review of History and Literature and Recommended by the Committee of the National Library.

and the other. My age, education, and training provide the tools I may need to make better judgments.

The last point of contention concerned the right to a Royal Charter. The Corporation claimed that it had been granted a Royal Charter by King Edward I in 1291, which gave it the right to have its own charter without the King's consent.





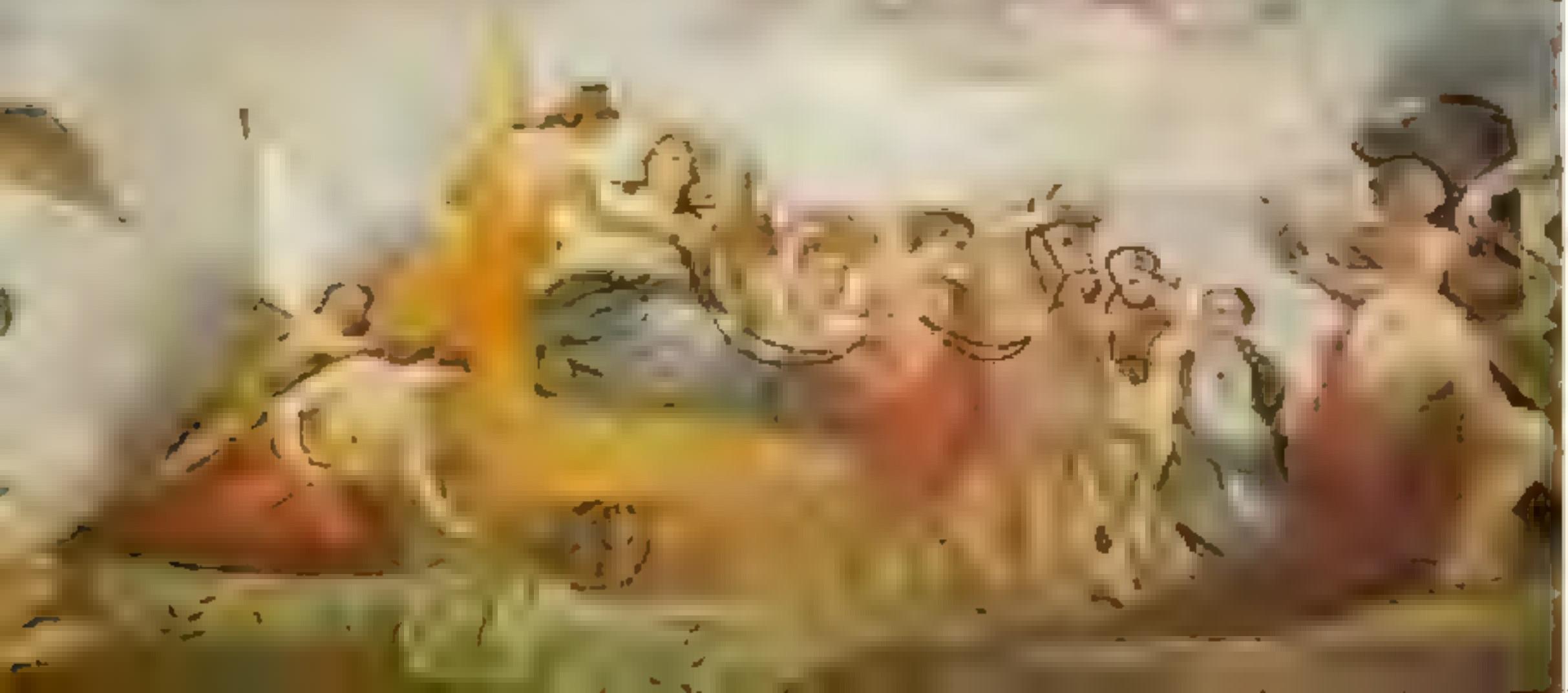


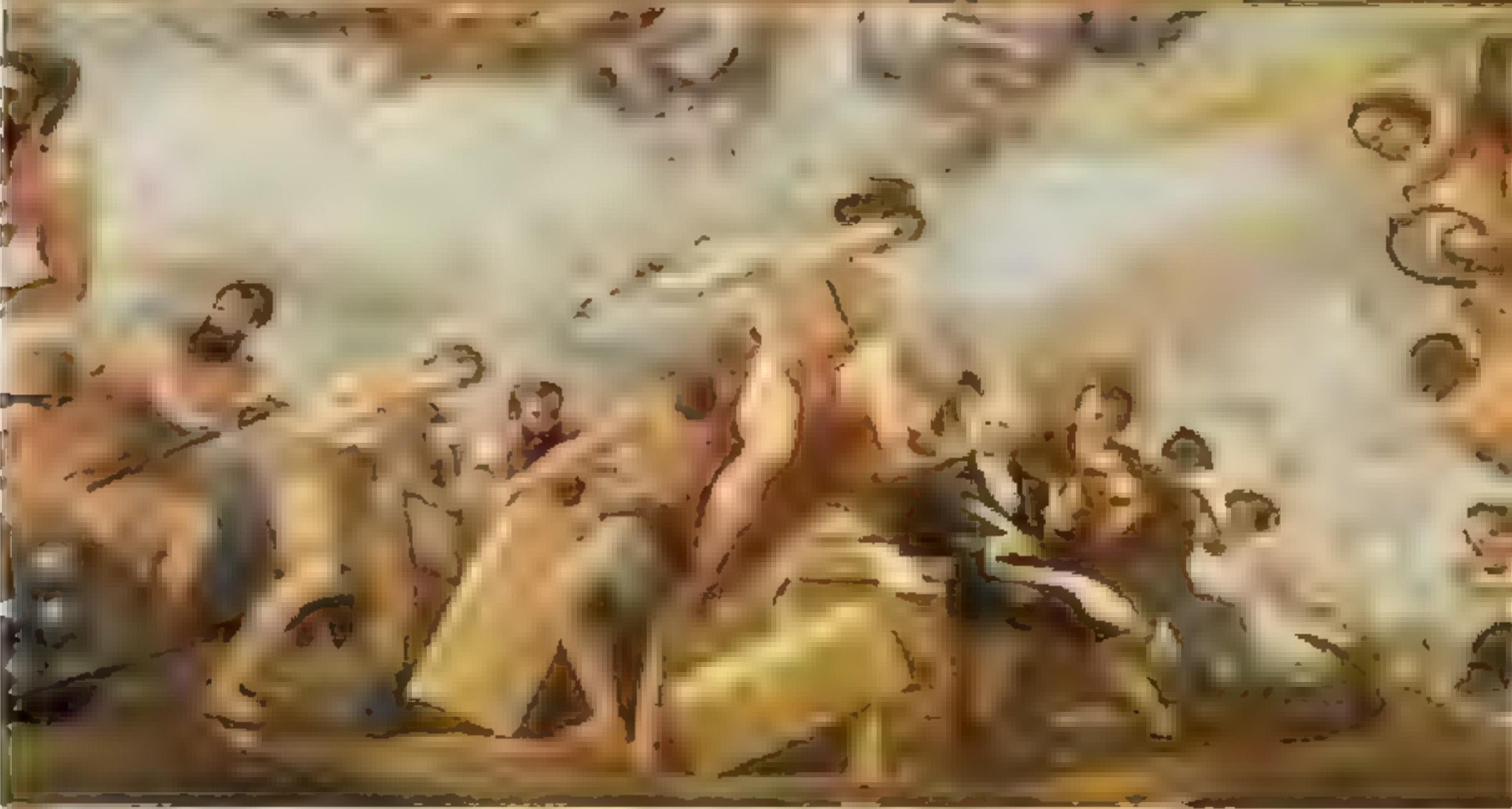
Kutnáři Completed
His Masterpiece,
the Dome's Fresco,
in 11 Months

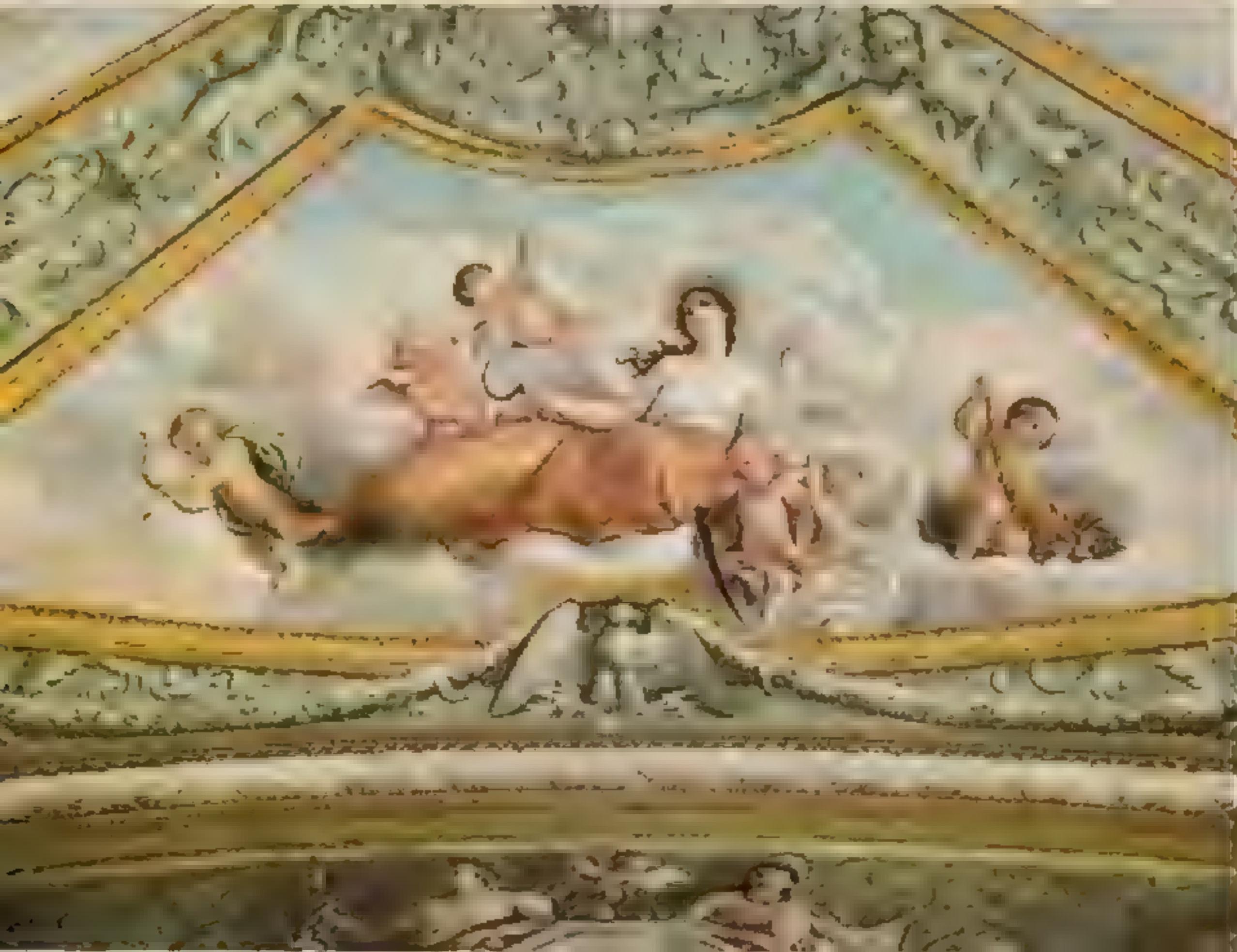
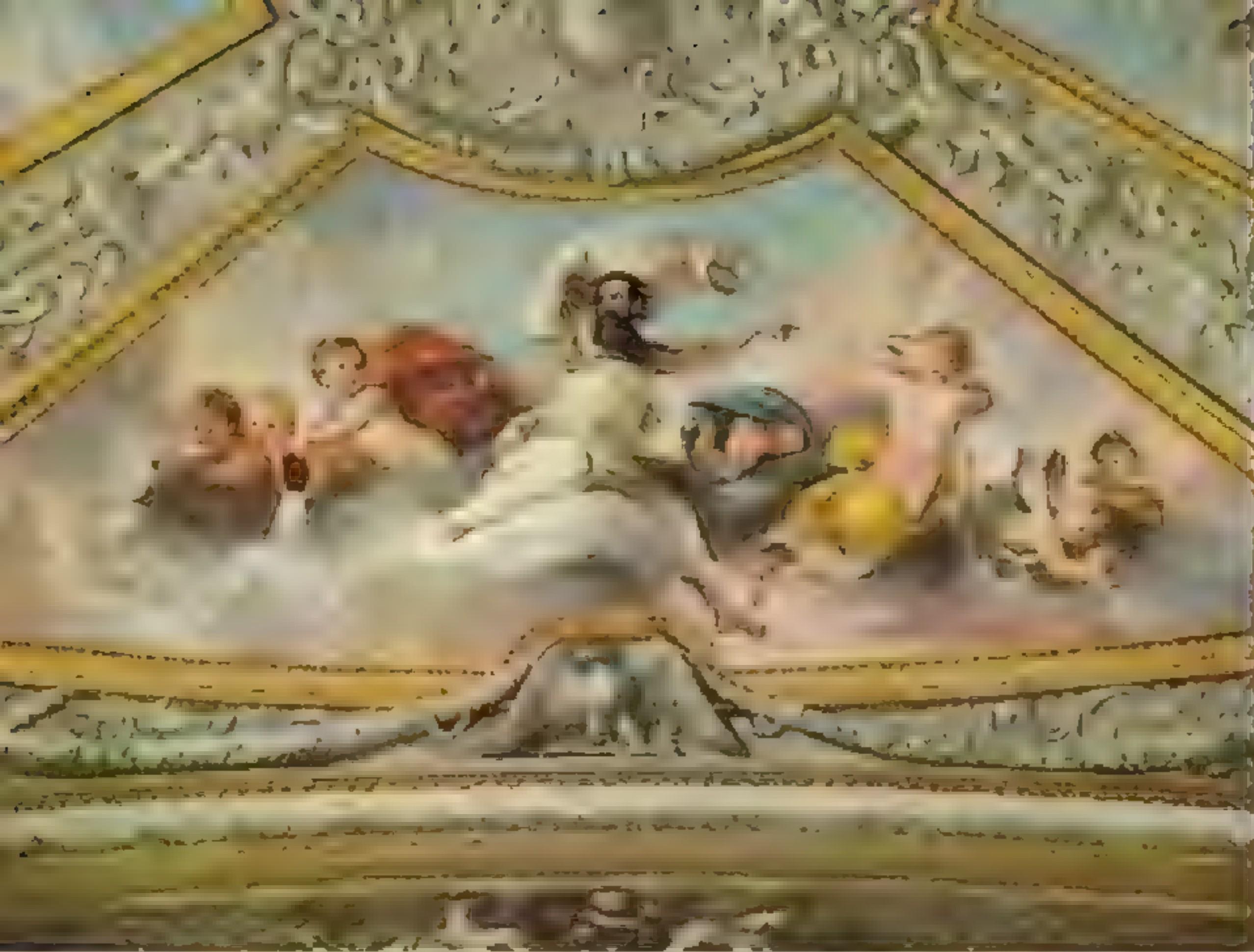
THE FRESCO ON THE DOME OF THE CHURCH OF ST. BARBARA IN KUTNÁ HORA, CZECHOSLOVAKIA, IS FINISHED. It took 11 months to complete the work, which was started in April. The artist, Václav Špála, 35, who had been working on it since he was 14, has now finished his first major work. He has also painted a series of frescoes in the town hall and the church of St. Barbara. Špála studied at the Faculty of Fine Arts and Sciences of the University of Prague, and he has won several awards for his work.

The dome fresco depicts the Virgin Mary, St. John the Baptist, and other saints.

The dome fresco depicts the Virgin Mary, St. John the Baptist, and other saints.







gray garments suddenly rose to her feet and began walking like a banshee. Newspapers called her "the Phantom."

"The Phantom was no stranger to us," said Capt. Olin Cavness, of the 170-man Capitol Police force. "During debate over a military bill in 1941, before we got into the war, she clambered herself to a bannister in the House gallery and started screaming.

"Under questioning she said she was a member of the 'Keepers of the Sacred Flame' and felt a compulsion to warn the world of its impending doom. She was committed on both occasions to a local hospital for mental observation, and later discharged."

On the whole, though, Capitol disturbances are rare. Police problems generally concern losses or petty thefts among the crews or damage to works of art by souvenir snatchers.

Ficketing of all kinds is prohibited by law within this building and its Grounds—one of the few public places in the country where this is so. Even wearing party campaign buttons here is banned.

Cogs in the Law Machine

Few of those who watch the formal proceedings of Congress are aware of the complex administrative and clerical activities that go on behind the scenes to keep the machinery of legislation in smooth running order.

Both Senate and House have their own separate working staffs, subject generally to the control of the political party in power. Officers of the House are elected or re-elected every two years, at the beginning of the new Congress. Officers of the Senate serve during "the pleasure of that body," because of the continuing nature of the Senate, which always retains two-thirds of its membership.

In a building where lawmakers' careers may be cut short after two years, many of these trained and valuable functionaries have held their posts for two, three, and more decades.

The congressional hierarchy is headed by the two presiding officers, the President of the Senate and the Speaker of the House. Two key administrative jobs are the Secretary of the Senate and the Clerk of the House. But there are also Parliamentarians, Sergeants at Arms, Doorkkeepers, Postmasters, and dozens

• 97 Years Have Not Dimmed Brumidi's Frescoes in the Capitol

One of the first to undertake the fresco to America the artist in 1835 completed Winter (above) and Autumn, two of the Four Seasons in the House Appropriations Committee Room, which in Brumidi's time belonged to the Agency of War Committee. Skillfully imitating in "stucco" and "moldings" make them appear as sculptured plaster than the work is painted.

of other officials and subofficials whose knowledge of detail and tradition is essential in the carrying out of the Congressman's numerous and often ritually prescribed duties.

70 Alert Blue-suited Pages

The congressional pages are, in a sense, Washington's youngest officials. These boys, from 14 to 18 years old, are selected by their Congressmen, with patronage committee approval. They run errands, distribute documents, and otherwise make themselves useful.

This session there are 21 Senate and 49 House pages; and it is a cheering sight to see one of them, in his standard blue suit, white shirt, and black tie, when you are lost in the mazes of Capitol corridors.

"Are you going to write about Congress or about us?" asked one of the boys when he heard I was gathering material for a NATIONAL GEOGRAPHIC article. "Hope you have lots of pictures," chimed in another.

The pages are paid \$285.23 a month and are not only very busy but also a good amount gossip. But they are by no means excluded from the formal educational chores of other boys of their age.

In a congressionally sponsored school started in 1927, they study history, languages, mathematics, and similar college-preparatory subjects (page 178). Together with eight Supreme Court pages, they start classes at the formidable hour of 6:15 a. m., stay with the academic world until 10:25, then move on to the day's business where history is in the making.

One book which is not in the Capitol Page School curriculum, but which the boys as well as Members of Congress study and use constantly, is the annual *Congressional Directory*. Published from the Capitol building and financed for and by Congress, this book contains up-to-date information concerning all government activities in Washington. It is known to have been issued as early as 1804.

This year the *Congressional Directory* contains 737 pages and has had a printing of more than 55,000 copies. Members receive a specified number free of charge, but other thousands of purchasers, through the Superintendent of Documents, make this volume one of Washington's perennial best sellers.

It is not hard to understand why, in the light of the *Directory's* contents. Its pages include charts to the physical layout of the Capitol building as well as a who's who guide to official Washington.

A still bigger publishing activity is the well-known *Congressional Record*. There is nothing quite like it in the world.

This daily report on all legislative meetings

of House and Senate has 531 "associate editors"—435 Representatives and 96 Senators.

High-speed stenographic reporters take down everything said during sessions. Until lately, some of the old-timers kept a tiny ink bottle strapped to a finger against sudden churrage.

But the *Record's* copy is not delivered to the Government Printing Office until it has been rushed to each Member quoted, for approval and "revision of remarks."

The lawmakers may also put into the appendix of each issue of the *Record* masses of printed matter of all sorts, from poetry to word-of-mouth.

In 1947, since 1947 a Congressional Daily Digest has been carried in the *Record*, providing quickly accessible capsules of information on congressional proceedings, committee work, and related data.

During the last session of Congress, more than 8 million copies of the *Record* were distributed. In all, they contained nearly a billion pages of closely printed material!

Home of "the Hermit"

Among all the words that have poured from the Capitol you look in vain for mention of its most mysterious and shadowy character—"the Hermit."

Until his death a few years ago, this man lived in an out-of-the-way workshop in the subbasement. He was fed from near-by kitchens and slept on a discarded door until sympathizers contributed a cot.

If Congress knew of the Hermit's existence, it gave no official sign; but many people I saw around the Capitol remembered him well.

"He was like something out of Disney," one of them told me. "But he must have seen better days. He was well informed and very fond of music. He particularly enjoyed the Marine Band concerts we have here in the summer in the Capitol Plaza."

When I learned about the Hermit, I thought I had heard everything. But there was still one more quest, a quest that led down winding dungeonlike stairs, through quiet passages, to a locked door.

"The tomb is directly under the center of the Rotunda," said my official escort as he opened the door and ushered me along a narrow hall to an iron-grilled barrier at the other end. "Of course it's a tomb in name only."

At this spot, I learned, Congress once had planned to raise a marble monument to George Washington and to transfer the General's remains here from Mount Vernon. The original project called for a circular opening in the floor of the Rotunda, from which visitors could look down on the Dietmural below.

The plan failed to materialize. For one

thing, Washington had asked in his will that he be buried at Mount Vernon. Though Martha Washington rather reluctantly agreed to the move, with the provision that her body also rest in the Capitol beside that of her husband, eventually the Washington heirs decided against it.

Rotunda Scene of Mourning

Through the iron gateway I saw a glass-enclosed catafalque, or bier, draped in black cloth. This badge of mourning is not for the man who rests at Mount Vernon but for all those chosen to lie in state in the Rotunda.

The catafalque has been used three 12 times, beginning with the grief-laden hours when endless lines of silent people moved past the body of Abraham Lincoln. Others who have lain there in state under the dome were Thaddeus Stevens, Charles Sumner, Garfield, John A. Logan, McKinley, the disinterred remains of L'Enfant, Admiral Dewey, the Unknown Soldier, Harding, Taft, and General Pershing.

"I saw the last five of these ceremonies," said chief guide Nash. "Most impressive to me was the time when the Unknown Soldier was here in 1921. A bontload of flowers came over with him from France. They were banked high along the walls and brought down in the form of a cross. Their sweet, heavy scent was almost overpowering."

At such times, when the Capitol overflows with humanity, it seems more than ever to belong to the people. But whether the citizen is in Washington, D. C., or in Washington State, his presence is always felt in this building. Its business, after all, is everybody's business.

Here, with few interruptions, all the Nation's laws have been enacted from 1800 to the present.

These statutes, which have guided the country's growth and rising power through ever-changing conditions, have reached the impressive total of nearly 70,000. Each session brings more to affect the life of citizens everywhere today and tomorrow.

In my wanderings I encountered in the old Senate wing a strange time-and-event juxtaposition. Congress's Joint Committee on Atomic Energy has its headquarters in the very room where Prof. S. F. B. Morse in 1844 ticked off his famous message, "What hath God wrought!" for the formal opening of Washington's first telegraph line.

"What our committees of the future will be concerned with is anybody's guess," one old-time Capitol employee remarked. "All I'm sure of is that they will have to deal with the same old human nature—and the sound of the human voice."

High Adventure in the Himalayas

By THOMAS WER



ONCE we returned to Scotland from India Douglas Scott had spoken to me about the Himalayas. We would be the first men to climb the heights of India in the highest range of all.

As he talked, his words carried me across steppes that climbed ridge after ridge, across the plateau of Tibet, across the Western Himalayan woods, across the great forest of bamboo with amazing varieties of looks, in a land 12,000 feet up, across shadowed slopes with pine forests, across the fields of wild poppies, across jungles of trees, across the land below.

Many of these areas in Tibet are still unclimbed, unexplored.

Now as we don't have more than £200, I had come with a plan. His eager question, "What do you want?" became the ring of strange notes, to go with the ring of adventure—the Kishi Gong. Now it lies between the teeth.

One of us must have no expensive bag or coat. Another's address were the same. We could live cheaply off the country.

We would explore the area of the Tibet-Nepal border, where it forms a natural boundary with India in the districts of Garhwal and

Almora (map page 10) which is considered as the most beautiful region of the whole 1,500-mile chain. Opportunities for the mountain expeditions ranged from unknown peaks to giant clusters of unscaled peaks—10,000 feet and more.

After these discussions, Bhutia tribesmen were reported to be our soberly honest servants, a people of great worth. They would sell us native food and even in the Nepalese Portals would help transport our gear.

Give Up Security, Choose Mountains

Now it was all the time to act. We had a growing brotherhood; for the 10 years we had been climbing, and we were all under 40. It meant giving up the security of good jobs, but we chose mountains, we took the risk.

First was our old chum, Tom Mackinnon and Bill Murray. The two others we would have chosen, from any company, were within the room. Mackinnon is a pharmacist; Murray an author.

Our party had a combined experience of more than 80 years of British and Alpine mountaineering. More important, we were well known to each other as members of the Scottish Mountaineering Club, and that meant

a lot when men must live together for long periods of isolation.

By mutual consent we appointed Bill Murray organizer. We had barely two months to prepare. Each of us was given tasks.

Scott made detailed climbing plans. On the basis of them, I worked out food and transport needs.

Staking the success of the expedition on local supplies, I decided to take a mere 440 pounds of food for five months. The main items were dried eggs, dried milk, pemmican, sugar, cheese, jam, chocolate, sweets, biscuits, dried soups, butter, and, of course, tea.

Tom MacKinnon was responsible for medical supplies—an obvious bit of casting.

Murray combed his friends and associates of the Alpine and Himalayan Clubs, without whose help and good counsel we could not have moved. He coordinated our efforts, showing a remarkable flair for administration.

Not knowing a word of the language was considered a minor difficulty; we could learn it as we went along. We Scots have an old saying that with a good Scottish tongue in your head you can go anywhere.

Heights a Heaven after Plains

The man who said it is more pleasant to travel than to arrive has certainly not crossed, in the dust and glare of midsummer, the 1,200 miles between Bombay and the first surge of the central Himalayas. It was a joyous moment when the green foothills reared above the haze—real green, like a memory of Loch Lomond's woods in a desert. In the sultry heat of May, India's hottest month, the parched plains cried for moisture.

We were glad to forsake the railway for a bus that zigzagged upward, climbing steeply through jungle to terraced fields. Wherever water could be brought, petioles and rice showed a rich green.

Mounting steeply, we came upon lilacs and exotic flowering shrubs. From green banks by the roadside, wild flowers sprouted in profusion. Now and again we had to wait for sacred gray langur monkeys to cross the road.

After the plains it was delightful to feel the hot wind grow gradually cooler. At Ranikhet, 6,000 feet up, storm clouds were disbanding the first time we had seen since leaving Glasgow.

Morning saw me out on the town in my pajamas. Beads of rain sparkled on flower and tree.

Ahead, crest after crest of jungle foothills caught low slanting sunrays of gold. Incredibly far above them, like silver writing in the sky, sniped peaks so unearthly that at first I could not believe I saw them. Those wondrous shapes were Nanda Ghunt, 20,700 feet;

Trisul, 23,360; Nanda Devi, 25,644; Nandi Kot, 22,310, and a peak teachable as our first objective, Bishnupuri Himal, 20,840.

Was it possible that we might tread these silver tops, the very throne of the gods? I could not believe it, but cried aloud for the mere joy of seeing.

Dobals Eager to Serve as Porters

When we sought porters—called coolies here—21 Dobals from Nepal were lined up before us by their headman, Kuar Singh. Superficially, they were a criminal-looking band, with their ropes and ragged boughspuns (page 193), but we liked them instantly, and it was rather pathetic when the selected refused at first to leave the line. But our needs were modest and four of them had to be left behind.

Our porters carried 80-pound loads, including 20 pounds of their own supplies and gear, for three rupees (about 63 cents) a day—four for mountain work. They furnished their own food, mostly flour from which they made chapatties, or thin pancakes. Loads were borne by headbands over the brow (page 200). We carried 20-pound loads in rock-sacks.

For the next 10 days we were on the march, zig-zagging over high ridges on fantastic paths, leaping down to rivers, crossing huge bluffs, and plumbing a wild ravine. From the skies of 12,145 foot Kauri Pass, we descended 6,000 feet to Tapovan (page 230).

At many of our camps MacKinnon had to open his dispensary as natives heard the news that white men were around. One almost blind old fellow expected his sight to be restored, and declared it to be so after swallowing a few tablets. Later he returned with his goat to have iodine applied to a wound in its hairy throat.

Wherever we went the natives were friendly. Puffing effusively bubble-bubble pipes, or spinning raw wool onto bobbins as they walked, they followed us for miles. They wore homespun tunics tight on the legs, with a blanket fastened over their shoulders in the manner of a Scottish plaid.

Already our porters had shown themselves to be men of sterling character. They were natural climbers and willing workers. Scots and Dobals understood each other, though we could not speak a common language. All hands were enjoying themselves.

Herbartsch Beckons

From Tapovan we headed for almost four-mile-high Bishnupuri Himal, our first objective, by way of the Reht Gorge. The country we were entering now was incomparably wilder than anything we had seen—a fierce tangle of rock spires split into two tremendous gorges,



Scratching His Shoulder, a Dancer Invites a Monkey Bitten by Fleas

A monkey scratches his shoulder. In the foreground, a man in a dark suit and a woman in a light dress stand looking at the monkey. The background shows a snowy, rocky landscape.

the Dhauladhar. For the last week
we had been climbing up the mountain slopes in snow.

In the 9th the temperature had
dropped back to the usual mark. We
climbed on the ridge at 12,000 feet
and down the snow slope as fast as
possible in our situation. Up here, little
birds have started to grow with pale
yellow and orange wings like two tiny
peacock feathers. And so of rock. Mar-
velous, up and back they go.

My guide telephoned to me from the
darkness with the report that the
goat was off the ridge. It was! It took us five
hours to bring him back.

We were now near the lower Koshi, a sheep-
watered valley and a place of snow.

What would we do? We were well away
from the nearest town or the nearest road
or hotel at the Rishikesh. We were to travel
the 12 miles to the village and not be min-

ted outside except "Sarita." But though
we did not know it, our last day's leg
was our share of the return. We could
hardly move a hand and one
of us was lame.

Nandi Devi, icy Goddess

The train was trudging on the paltas. On
the crest, a tall, thin, slender figure
in the sacred air of Dhauladhar. We were
tired, but the robes of cloth covered us with
warmth, though the air was cold.

Ahead, above the rock walls of the Rishik
rose Nanda Devi. All other mountains we
had ever seen were insignificant beside the
"Blessed Goddess." It goes without saying
that this great mountain has been on
my head almost five years. I have a good
mind.

Incredible the task a person could
have in looking at the mountain.



Photo by W. H. T.

W. H. Tilman Skirt a Glacier Crevasse near Base Thorstep on Finch Glac.

Unstable ice barred the way from reaching Finch Chuk's 22,650-foot crest (pages 119-121). Camped on the glacier at 19,000 feet, he had to climb 3,000 feet to reach the top. Here he is shown just as he reached the edge of a crevasse.

of the south ridge, we took off our caps to H. W. Tilman and the 1936 Anglo-American expedition for their fine performance in climbing it. To my mind, the feat still ranks as the greatest of all mountaineering achievements.

By the time we reached the gray flood of the Rish, 13 porters had been paid off, but the remaining six worked furiously to throw a log bridge across (pages 218-29).

Size 6 Fits Everybody

After the crossing came more hard climbing, but at last we stood at the foot of Benthall, our mountain. Nearly 9,000 feet above us, high above a welter of hanging ice, loomed the peak we hoped to climb. From here we could see no safe route to the top. The danger of avalanche was all too apparent.

In planning the expedition, we had bargained for three porters coming high with us,

and accordingly we had purchased boots, sleeping bags, and high-altitude clothing for them. Now was the time to present them, and the porters were as delighted as children at Christmastime.

All but the sleeping bags had been bought at Glasgow Barrows, a kind of "Hawker's Bazaar" in Gallowgate, where you can buy, at cutthroat prices, anything from a wooden box to a pair of long drawers. The boot size was a pure gamble, but acting on advice we had chosen size 6. We prayed that they would fit.

Beaming all over, Zungku, Gorla, and Matir tried them on. They fitted.

Food was our main worry. That man-load of flour lost meant that our climbing time would have to be cut by six days, leaving only five for reconnaissance and getting to the top.

Ascending to 14,000 feet next morning, we



Earth's Biggest Dunes: the High-Altitude Tait Nuru Mounds of Tibet - I Searle

saw that snow from the north ridge must take the line of a protective rock rib, for otherwise we were liable to attack from an artillery of huge poised blocks and littering masses of ice. We decided to place our faith to this rib in the hope that it offered a route to the summit. That same day we brought porters and tents to 14,500 feet.

The reward of being up there came at evening, when the clouds that had lain on the high tops all day suddenly spilt off. The

re I saw, breaking through, lighted a ring of
mystic peaks that shot like needles to
more than 20,000 feet, peaks with challenging
names like Changchung (22,520 feet), Ka-
lachha (22,740), Rishi Kat (20,400), and vari-
ous others unnamed (pages 202-3).

There was snow on the ground when we
rode at 5 a.m. and started up the ridge.
Loose and stony at first, it crossed a snow
gully, then steepened to rock, demanding use
of hands as well as feet. In 2,000 feet the

ridge narrowed to an arête, or sharp edge, of snow, corniced on one side, with a little gendarme, or rock tower, blocking the way.

The cookes had climbed magnificently, though troubled by altitude. At about 17,800 feet we decided it was unfair to ask men unaccustomed to Alpineism to go further. With many salutes they departed for the lower camp.

Chasm Defends Bethartoli's Crown

Bad weather was closing in, so MacKinnon and I cut platforms for the tents in the snow of the narrow ridge, while Murray and Scott reconnoitered.

Back they came with bad news. Ahead yawned a 100-foot gulf impossible to climb down. We could have fixed the rope and slid down, but we could never have returned the same way.

To get over this nasty shack we crawled into the tents, got the stove going, and melted snow for pemmican soup and tea with biscuits.

Eating brought on breathlessness, and even to turn in our sleeping bags made us gasp like newly hatched fish. Plainly we were not yet accustomed to the heights; a dull, persistent headache proved it. And, although we were reasonably warm in our eider-down bags, our breath froze on the tents, falling in the form of powdery snow.

Bitter as the cold was our sense of frustration—blocked by an impassable gulf when only 3,000 feet from our goal.

But our spirits rose with the morning sun. To be here in this glistening world was the ultimate reward. Far below lay the forest, steep-walled enclosing the Rishi. Up here the rock, snow, and ice were alive, the tip of Nanda Devi shooting like an arrow above the tiny tents on the crest of the ridge.

Because of loss of that week's supply of flour, there was insufficient time for another attempt. Thus Bethartoli beat us.

But our failure had taught us a few things about Himalayan climbing, camping at high altitudes, and our reactions in the rarefied air. It had given us a new appreciation of scale, without which no one can climb so easily in the Himalayas, for what appears from below to be a tiny nick in a ridge can turn out to be a virtual chasm, precisely the kind of thing that stopped us on Bethartoli.

The lessons were to be rubbed in. Rising above the Rishi, the 19,930-foot peak of Hanuman, the "Monkey God," had taken our fancy.

All went well until we were less than 1,000 feet from its summit. Then, to our intense disappointment, we were stopped at 19,000 feet by another cut-off similar to the one on Bethartoli but deeper.

In fast-falling snow and thick mist we had an anxious time descending. It took so long

that we finished in a race with the gathering darkness. We steered by compass, little except the stars a guide to the route.

Such odds in the gloom we smelled wood smoke, and with twitching nostrils followed it to camp. By carrying up juniper wood and keeping a fire going the porters had saved us from a night out.

Listening to the blatter of snow and wind as we lay snug in our sleeping bags, we not only blessed our Dotial friends but gave thanks for the precaution of taking a compass bearing back to camp in the morning when it was clear enough to see its direction from the peak.

Next day we headed back to our base at Tapovan. It was a journey done on short rations of rice eked out with wild rhubarb, curtailed allotments of chapatties, and a modicum of butter, cheese, and pemmican. We had native beans, but these proved so disagreeing to our internal economy that not even the porters would eat them.

Winding down to Tapovan, we were sorry to be descending to 6,000 feet among the fly-ridden hounds of man, but glad to be nearing a food dump.

June had come, and in two weeks we had jumped from winter to spring. Snow gulches that had troubled us on the ascent were slunken beyond recognition, and hosts of new flowers were abloom—forget-me-nots, wild geranium, sweet peas, and whole hillsides of yellow lilies.

Over the gorge soared a Himalayan golden eagle, much like the bird we see on Scottish hills. The voice of the cuckoo had come to the Rishi; flocks of snow pigeons twisted over the crags on silver wings; and Himalayan bulbuls occupied the upper tree line. Tree pipits were performing their flights of love.

On a Dizzy Trade Route to Tibet

The next phase of the expedition, timed to take place before the arrival of the monsoon in early July, was reconnaissance of the Lam-pak Mountains from the south. Our way lay up the Dhaul Gorge, one of the great trade routes of the central Himalayas and a track to Tibet (map, page 197). Where the Rishi had been grand, this was austere, for few trees grace its steel-gray walls of rock (page 208).

The track wound along these walls, high above the rushing Dhaul River. In some places it hung suspended in space, supported by ancient stanchions driven into the rocks. No doubt they had been put there by the British when they administered this area, for it was their responsibility to keep the passes open.

Traffic was heavy on this highway. Nomads were lugging their household effects some carried bags in baskets. Curiously clad



Merde Glacier Tumbles down the Black Chil Range in a Wall of River Ice

located on the lower slopes of the range from 11,000 feet up to the treeline. Every year
it adds about 100 feet to its length and 100 cubic yards to its volume.



A Porter's Inn built on the top of the Wimble Branch, which terminates in the hills of Kenton. Parks Wood, on Pounds

Yard, Acre Lane, and Green Lane, and on the road leading to the village of Wimbleton. The inn is a large, comfortable building, with a large room for dancing, and a good library.

London.



Sunset's Fading Glare Illuminates the Crags above a Shadowy Chasm; Hau'ula Pass



Spry Clouds Draft Like Snow: Edged with a Milky Granite Suggests a Shark's Tooth

- The figure consists of three vertically stacked bar charts, each representing a different rice variety: IR64 (top), IR8 (middle), and IR104 (bottom). Each chart displays the average yield (kg/ha) and fertilizer use (kg/ha) for four different treatments. The treatments are represented by bars of increasing height from left to right: Fertilizer only (F), Fertilizer + 10% NPK (FN), Fertilizer + 20% NPK (FN2), and Fertilizer + 30% NPK (FN3). The y-axis for all charts ranges from 0 to 6000 kg/ha.

Variety	Treatment	Avg Yield (kg/ha)	Fertilizer Use (kg/ha)
IR64	F	~3500	~100
	FN	~4000	~150
	FN2	~4500	~200
	FN3	~5000	~250
IR8	F	~3000	~100
	FN	~3500	~150
	FN2	~4000	~200
	FN3	~4500	~250
IR104	F	~3000	~100
	FN	~3500	~150
	FN2	~4000	~200
	FN3	~4500	~250







A Household in the Wild, Spring Red Kerosene Lamp and Internal White

poor old man, who had been a soldier in the Chinese army, and had lost his right arm in battle, was sitting on the ground, holding a small lamp in his left hand, and looking at it. He was wearing a simple cloth coat and trousers, and a wide-brimmed hat. He was holding a small child in his arms. The child was looking up at the lamp with a curious expression. The old man was smiling slightly. In the background, there were some trees and bushes.

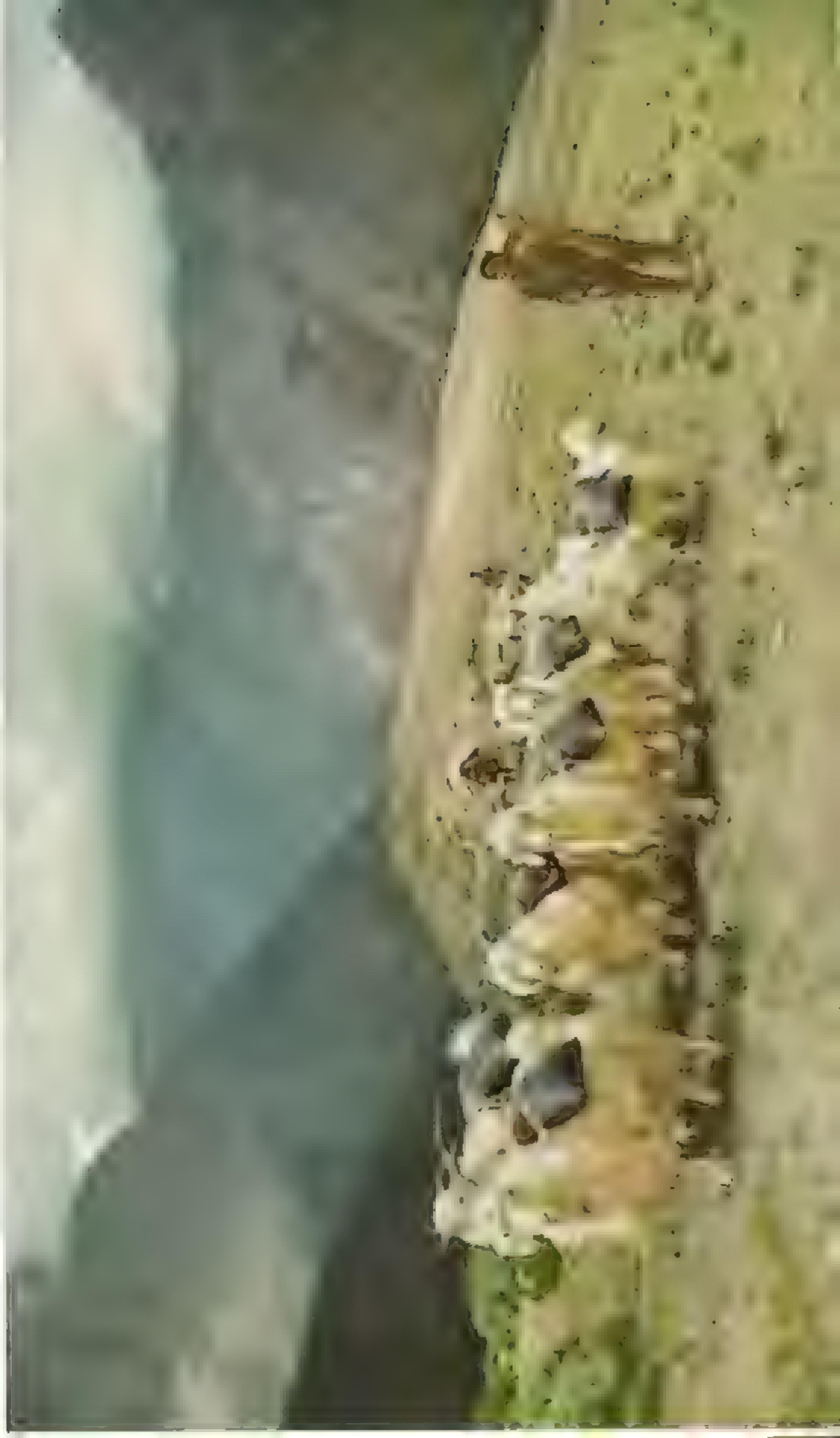


Dear Readers! We
have just down-
loaded our first
book from the
Kindle store. It is
a collection of
poems by the
famous poet
Rabindranath Tagore.
The book is
available on the
Kindle store. It
is a great honor
for us to have
our first book
published.

We are very happy
to have our first
book published.
We are looking
forward to more
books in the
future. We hope
that our books
will bring joy
and happiness
to many people.
Thank you for
your support.

The team at
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would like to
thank all the
readers for their
support. We are
very grateful
to have such
a wonderful
team behind
the scenes.
Thank you for
your support.

This Was the Second Train
Belated Soldiers. 24 Battles of Fredericksburg
or Third Battle of Bull Run. The First Battle of Bull Run
was fought on July 21, 1861.





A Glistening Ice Curtain Three Miles Long Hangs from the Crest of Tisseli



Tents Stand in a 15,000-foot Meadow; Alpine Flowers Star the Ground

A. *Mossy Glens*, San Joaquin Valley, California. Marks above Indian's River in Green Valley, Pictures taken for Survey of California and Nevada by the U.S. Geodetic Survey.

B. *Mossy Glens*, San Joaquin Valley, California. Marks above Indian's River in Green Valley, Pictures taken for Survey of California and Nevada by the U.S. Geodetic Survey.





India Looks Toward Tibet's 19,000-foot Peaks Across Miles-deep Girihi Gorge

Tibetans, wearing extreme bush hats, colored woolen boots, and thick coats, herded sheep and goats, each animal fitted with small saddlebags containing salt or borax.

The sheep would be sheared here in India. Then back the patient Tibetans would go, bearing their barter—Indian rice or wheat, or manufactured goods.

These Tibetans are solemn men, but give them a smile and their faces nearly split in half with welcoming joy.

Climbing up a side ravine to reconnoiter a route to the Lamruk Mountains, we came to a most beautiful village situated on an alp. Its stonework and finely carved wooden balustrades were the best we had seen. But to our surprise the place was entirely deserted.

We found out why when we climbed 3,000 feet higher to Dunagiri, a village of Bhutias, perched at 11,800 feet above a glen of wild roses, walnut trees, and sweet-smelling shrubs.

Bhotias Migrate Like Birds

Bhotias, like the birds of the Himalayas, have different life zones, occupied according to the season. Many tribes have three villages, the highest being close to the Tibetan border, for Bhotia means "Man of Tibet."

These people are traders. From their high summer homes they journey far into Tibet, carrying grain and rice, or other goods, to barter for salt, borax, or trinkets. Like Tibetans they use sheep and goats as pack animals.

When the two-month trading season is over, these birds of passage journey down to autumn quarters. Gathering in the lower valleys, they hold their traditional . . .

Winter's approach sees them in their lowest hours, whence many journey to the plains to buy goods for next year's trade.

Such a life breeds self-reliance and a great knowledge of mountain and men.

The people of Dunagiri greeted us with smiles of pleasure. Many were red-cheeked and almost fair-skinned.

When we asked if we could obtain food bowls of *ato* (native flour) promptly appeared. Then potatoes! They were a Scottish variety known as Arran Banners, but of a quality I have never seen in Arran or elsewhere. It appeared that they had been introduced into the hills by the former British administration to better the lives of the people.

At this altitude the potatoes took twice the normal time to cook, but they tasted even better than they looked. Replete, we toured the town.

In a little square the village school children squatted, slates on knees, while an ancient professor put them through their lessons (pages 207 and 234). After greeting us and draw-

ing the class to attention, he pointed to my pockets. He wanted to see what was in them—for educational purposes.

The old teacher proceeded to give the class a lecture on my belongings, each item being greeted with cries of joy. He took evident pride in showing his familiarity with such things as watch and compass, but was completely stumped by my exposure meter.

Wherever we went in India we saw new schools being built. One was going up here. The villagers were well dressed. For best, the men wear homespun consisting of tight trousers with matching jacket of semi-European cut. The dress of Bhotia women, however, is rather baggy and unbecoming. Ornaments range from silver girdles, anklets, nose rings, and earrings to clusters of bear claws (pages 217 and 228).

At Dunagiri, ailing residents were brought to us for treatment. The worst case was a little girl whose lower leg and foot were black with gangrene and swollen with pus. MacKinnon at first despaired of her life, but his penicillin had the child well on the way to recovery when we left.

Later we were shocked to discover that many of the people in this area have venereal disease, and that tuberculosis is rife among them.

Unfortunately, too, they are much addicted to a form of rice spirit that is very near raw alcohol. Locally, it is called *chang* (the same word used for the milder Tibetan beer), and it seems to result in a lowering of physical and moral standards.

Despite this, however, we found the Bhotias the toughest of travelers and the happiest of men when we had the good fortune to get them to work for us.

From Dunagiri we made two climbs that gave us our first success in pioneering new ascents. The first was a rock-and-snow one of 17,840 feet; the second a 16,090-foot rock climb to a knife edge of granite.

A brief view from the latter through boiling cloud layers showed that the Lamruk Mountains could not be climbed from Dunagiri. Uncompromising ice walls offered no hope of ascent from this side.

Dance Honors Gods of Fertility

Leaving Dunagiri, we headed for the north side of the range to have a look from there. With us were five huge pack animals called *jhibus*—crosses between yak and cow—and our faithful six dogs.

Our fears of an early monsoon were strengthened when we came down to Malati village in the upper Dhauladhar. To hasten the coming of the rains the gods of fertility were being honored by six Bhotia men and



Bhotia Tribesmen Clip Fleece from Shaggy Tibetan Sheep

A TIBETAN TRIBE IS known by this last name, because it is the most long-haired people.

The women wear long, dark green dresses, and the men's robes are redder than they demand, and Bostonians consider them clean, because of their superstitious ways.

The shepherds who work at the sheep-shearing were made of the poorest and strongest material. They worked in a clockwise pattern around the sheep, and through the matted coat pulled out wool, or picking up bunches of it, and then letting it trickle through their fingers. Sometimes they rubbed their foreheads with cream or earth, rubbed their brows with charcoal from the altar, or passed their hands over them. At the sun the strength of the same went on.

It is not known exactly how many tribes there are in Tibet, but there are about 100.

In the winter the men shaved a hole in the middle of their shaggy heads, about half way down, and threw her out to freeze. She was so cold that her face turned blue, and she died.

Milari is a vertical place, and the vertical walls are so high that the men cannot boulders one above the other.

That Milari is a small town populated by the natives of the narrow valley. It is built on a rocky ridge, and the edge of the ridge is a high, craggy, rocky wall, which is covered with snow and ice.

For a time we had a continuation of the same place. Until now we left Milari the day before we began the crossing of

over the Drifts—
Winters, 16 Degrees F.
W., and 18 Days
Cloudy.

Climbing to 10,000
feet across the snow
on top of the Siang-
ka-Ping I saw the
carnation, tulip,
yellow primroses,
blue saxifrage,
dianthus, and other
brighter ones.

Last night filled me
with a world of ped-
estal glacier mud canyons
and a huge waterfall
was the size of a peak
in the Tia Chiu, 10,-
750 feet. Clouds are
so sumptuous
one tells where the
mountains are like
mists, but not at
all.

I went to a hotel
in Chong-tien, and
there was a slide of
ice 100 feet long sweeping downward to
the splinters; we knew
they must be gone in
a few days to show such
large.

Accepting the mouth-
ful of mud challenge,
we started with three
men and supplies for
a climb up to 14,000.

The morning very
cold and we except
from the mud and
heavy precipitation,
and I said the Indians
were not fit to go in
such a place.

After a day, our
six drivers were telling the altitude. One was
saying the cars were going very slowly.
I said due to the men that they carried to
17,300 feet to pitch our tents some 600 feet
below the passes. He said others
had the bus; the other three stayed with us.

Wild Mountain Sheep Share Heights

Tom Mackinnon had much to say about
natives of the mountains and reported them
as the most dangerous men. He had
left a native to a goat which
before this he had judged it unable to
get out of the trap.

We were not alone. There—



A Dongagiri Girl Wears a Nose Ring Bigger than a Bracelet

Other women in the tribe wear nose rings, but none so large as this. They are made of silver and are considered to be the best ornamentation.

of bharal—wild mountain sheep—appeared at heights equivalent to our own.

From our camp the scene contrast was startling. On the Indian side, from north to south, the country rises in great steps, from the red brown rock slopes to the ridges and stretching upward to the snow. No human habitation, except here and there a small cluster of huts, their roofs whitened by falling hills, their sides

white with snow. Not a single star in the sky ever had a chance to get away. We were looking over the Indian plateau, stretching to the right, across the valley.



Ward Full Pack ■ Poster Tracks Across the Righteous Sender, Gunking I-9



A Rope-Hauling Aids Balneer Glacier Workers Swell the Menden Stream

To reach the snow fields above the 11,000-foot level, the workers must cross the Menden River. A rope-hauling system has been developed to help them cross.



Zuniga Models His Handiwork, a Wool Sweater

This dotted porter fastened the yarn with a hand spindle while carrying his pack. Using homemade needles, he knitted by campfire a fine wool sweater. Though shaggy, Zuniga proved to be the ablest porter.

When night had come to the valleys, high peaks still burned with sun glow.

Breakfast in a high camp is not a jolly affair. Getting out of a sleeping bag is not so bad as the business that precedes it. From biscuits and lukewarm tea down one at a time the latter from a flask filled the night before, tents and other preparations seem a non-pottered nuisance at such times, and it is a brave man who will say anything controversial.

At 5:30 a.m., with this behind us, we set off with two porters. Tom MacKinnon and I started one, Bill Murray and Douglas Scott the other. Clouds enveloped us.

Crossing a Wall of Ice

Above 18,000 feet the trail quickly narrowed to a knife edge calling for care. Soon we saw that we must traverse an ice wall and

cross an overwhelming current.

At such times it is necessary to have a good anchor ice on the mountain, such as a self-driven ice ax with a turn of rope around it. A slip by the side can then be checked by being secured that 100 lbs. over a few inches of a turn in the ice will suffice. It looked woefully insufficient with a drop below of thousands of feet.

But MacKinnon led confidently. Cutting loose, and footholds, he moved across the wall stopping midway to ask me if I was quite happy. He told me he was fully enjoying himself.

He got outword Tom swing himself over the knife on the far side, out of sight. Five minutes passed and then I heard his cheery cry to come on.

At 19,000 feet we required two breaths to every step. I had crossed a second ledge, worse than the first, and pitched onward, driving each foot carefully into the narrow ledge.

Suddenly a fragile blade of snow loomed ahead—the 20,350-foot sun mit of Mt. Tuckel. It was snowing as we crowded onto its narrow top, to look down ice walls disappearing into gloom.

In such a situation one does not feel a certain quite the reverse. The climb had taken eight and a half hours, and we were going to meet all available time for the descent. Besides, it was too cold to linger.

Anchored Rope Saves All Four

On the way down our save strops had proved their worth, for an ice step broke under MacKinnon's weight, shooting him down 4 feet before he was pulled up by the rope. Without this anchorage, in rock this time, we all probably would have been pulled off.

Almost unnoticed at first, a minor miracle was taking place. The clouds that had enveloped us all day were submerging to the valleys,

of the mountain peaks for the higher col.

In waves of snow the mountain peaks were visible, the highest, however, hidden in a billowing cloud, though by a 20-foot margin of sublimity the mountain stood out in titanic splendor.

Even as we looked the warmth was withdrawn from the sky. The rolling clouds faded to shadow. The immensity of depth, of incredible space, is something I am never likely to forget. It was a feeling of being lost in the earth, but even in the planet

The confidence that looks at the tools and instruments had not only submerged the clouds, but had given us a clear sky. From it now shone a three-quarter moon to light our campward steps. We struck the tent just 18 hours from the time we left it. Cut

and no one was hungry, though we had eaten little all day. Altitude has strange effects.

Next morning the sun shone warmly on the tents. It was delightful, but not for Mackinnon. He was snow blind, and the tent had to be darkened to ease him relief for his eyes.

In the clouds again, so hot and much trouble. The wind grew stronger and harder to stand in the snow drifts. The men now sawing the wood last night were still there 24 hours.

Meanwhile we prepared another attack. A whole new set of a pack we called Scott. I could do nothing but seem a fair hope of saving it. We took up the ice sledging trail, the men carrying 1,000 feet to pitch our tent.

Wild Creepers Seen Huge Butterflies

Around our camp at 13,000 feet, pink and yellow flowers were so thickly massed that we couldn't avoid trampling on them. At about us were many birds—Towhees, plain-back



A Braided Girl at Her Spinning Wheel at Milam

She pulls the raw cotton through the spinning wheel, then spins it out to the whirling bobbin. Gained this power a treadle turning the bobbin and won me the yarn. Most Indians are good at spinning.

mountain thrasher—pupils singing their songs—cardinals—the lovely thrush-like bird of Coal Hill—said, afterward mentioned as an unclassified species of grandala. Alpine choughs—blue jays.

Most beautiful of all was a wall creeper, fluttering its gray and crimson wings like some huge butterfly as it climbed a vertical cliff in search of insects.

We were up in the hills in mid-June, and could find a camp at more than 18,000 feet on the edge of an airy snow cornice with long drops on either side. The summit was less than 300 feet above. Ahead was an 8,000-foot sheer batter—steep but not precipitous, according to us, we thought.

Came the hour of rising for the attempt 5:30 a.m.—and we had to withdraw to our sleeping bags. Wet snow pattered against the tents, and visibility was nil.

There was nothing we could do but lie up and watch puddles form on the tent floor. I read the Gospel of John while avalanches roared off the peaks, falling down each side of us.

Pinned down, we could do no more than wait, enduring the cissimile discomforts that small tents impose. The second night passed like an age.

Now it grew colder; ice encased the.govtapes. The mountain was in no mood for climbing. We shouldered the packs, roped up, and descended 5,000 feet.

Five days had been spent on this attempt, but there was time for another try. Once again we camped on the snow cornice under the 800-foot cliff, and once again foul weather developed overnight. But this time we came to grips with the crags in an attempt to force the peak.

To our disgust the rock was mere shale, so rotten that it came away in handfuls. There was no choice but to cut steps back to camp and pack up.

Into the Girthi's Scenic Savagery

Now we came to what promised to be the most exciting phase of the expedition, the traverse of the Girthi Gorge.

Our route lay across the flank of Uja Tirche, through flowers that filled the air with their fragrance. Now we would be tramping through a haze of vivid blue rock geraniums or bright red potentillas. Then we would be brought to a halt by saxifrages clustering among the rocks, or dewdrops sparkling in the tiny blue eyes of pincushion mosses.

On this fresh morning, the Himalayas of imagination had come to life. From the crest of the Girthi pass we took our last look at the peaks that had been our companions for the past three weeks. They cleaved the air like knife blades. Could it be that we had camped up there among those ice flutings so delicately poised on the blue-black sky?

When we took the plunge into the Girthi, it was like heading into another world. This was a vegetationless world, a world of naked rock that rose sheer on the north side 7,000 feet from the river (page 214). On our side the wall of Uja Tirche sent down a great buttress to make the most impressive ravine we had seen, a Grand Canyon of the Colorado on a more vertical scale.

Yet, for all the arid prospect, there were flowers at our feet as we rounded the first bluff, flowers that found foothold in stones. There was even a thistle like our Scottish one, and roses that grew in a bower over our heads.

In this incredibly wild country, we were amazed to find an attempt being made to establish a settlement. It consisted of two

thatched houses, built, we were told, by Malar Bhutias with the pioneering spirit. They had even built two little shrines, about the size and shape of dog kennels.

The menfolk were away from home, but there were two attractive women who smiled with bad effect on our taste.

In this Girthi crossing, we had expected difficulty with glacier streams, but none held us up unduly. The main trouble with Himalayan rivers is that the holders on the bed are moving with the rush of water. The correct technique is to charge through. To try to balance across is to be swept away.

At the Border of Tibet

By the fourth day we were through the gorges, and in mist and rain we climbed into the snow and stones of the Uta Dhura pass at 17,640 feet. We had reached the border where northeast lies Tibet and southeast lies India.

In this desolate place we heard, of a sudden, the jangle of bells and the wild cries of drivers. Streaming out of the mist came dim forms of yaks and sheep driven by Tibetans who stopped in their tracks to stare at us. They wore robes of blue and scarlet, and all carried knives or swords as protection against bandits. For the next few hours caravan after caravan passed over this bleak height.

(At the time of our visit, the Communists had not yet taken over Tibet.)

Our men had done well on the climb. They did even better on the descent. Next day we strolled into Milam, the first village in India. Its millet fields and neat squares of houses gave it the appearance of a Promised Land—and that is what it must seem to Tibetans after the hostility of the high passes.

At once we were greeted cordially and conducted through courtyards piled with saddlebags, where Tibetans lounged and Bhotia women wove carpets or ground flour. Local people were eager to introduce us to another European, Leonard Moules of the Worldwide Evangelization Crusade. He had hoped to carry Bibles to Tibet, but permission had just been refused him.

Len had been doctoring the natives for the past six weeks, sometimes dealing with as many as 100 cases a day. Right now he was about to remove a cataract from an eye.

Drums Announce a Farewell Party

Milam was the turning point of the expedition. Mackinnon's time was up, and sorrowfully we said goodbye as he left with one porter for the long trek to Ranikhet.

For us, money was running short. The last phase of the expedition, reconnaissance of Panch Chuli, 22,650 feet, would need to be



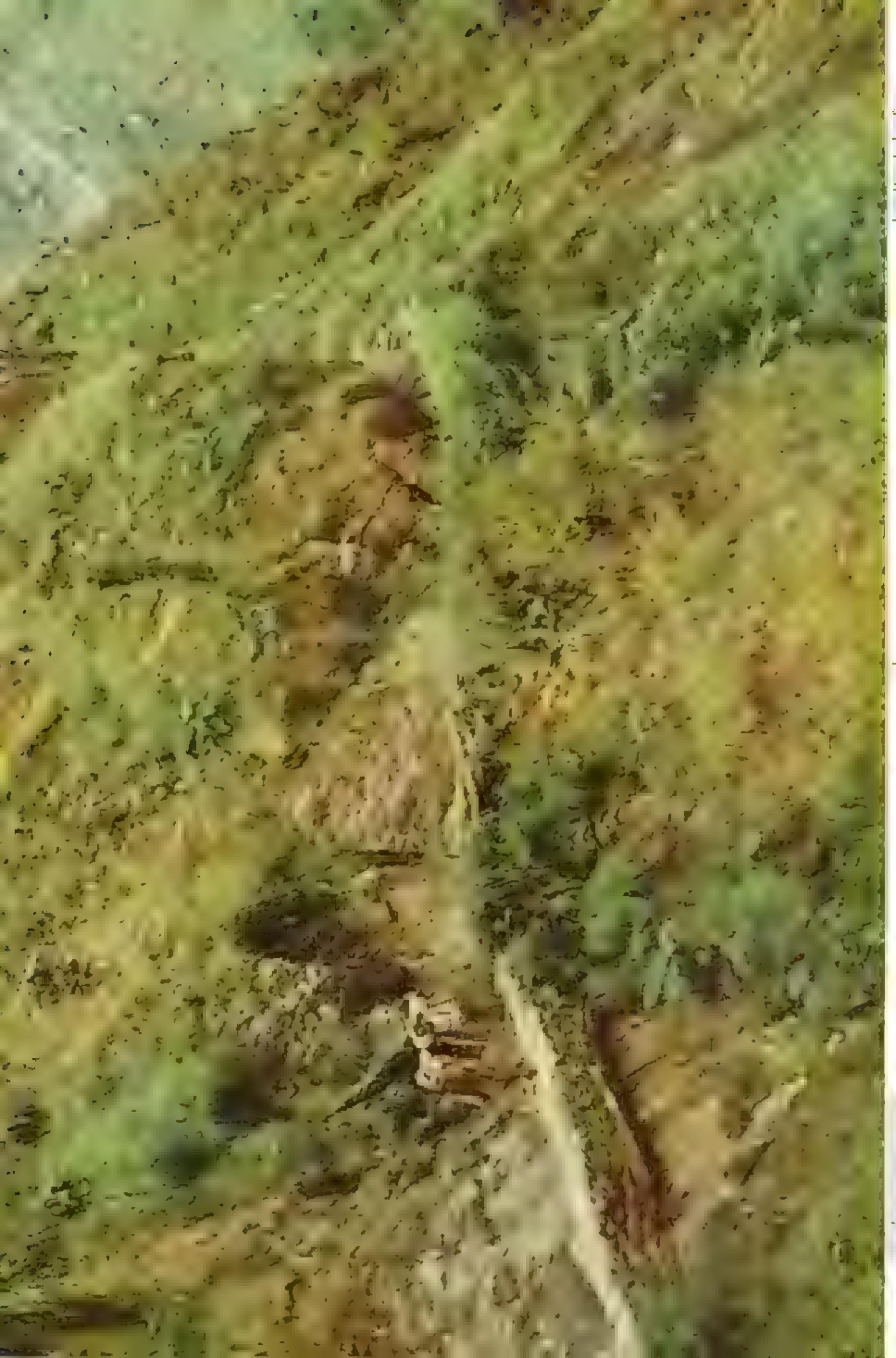
After a Jungle Trek, All Hands Relax in a Camper's Fly-free Paradise

I expect you will be surprised to learn that the
whole thing is now a complete success. The
original plan was to have the first edition
of the book published in October, but we have
had to wait until November to get it out. I am
very sorry about this, but there has been a
great deal of trouble over the last few weeks.

✓ **Amateur Cards from "Handy" I strip**
Spine Hand Soap and Perfume

Christopher French's *French Book* — which I have had for some time now — is a good one. Very much developed, it contains many good points. However, it lacks the main — the most important — point, I think, however, less, and the author says nothing about it.





• Workers' March
Believe in the Poor

• Class Party in
Industrialized Nations

• The Industrial Revolution
was a historical event
caused by technological
and social changes in
the use of power
to increase economic
output. It began in
England in the late
18th century and
spread to other parts
of Europe and North
America in the 19th
century.

• Industrial Society
in Third World
in Western Asia

• Industrial Society
in South America
in Central America
in South Africa

• Industrial Society
in South America
in Central America
in South Africa





Drummers Beat a Ceremonial Rhythm as Yansu Village Greets the Explorers



Murray, left, and Scott Gwynne stand at their spot in the Town Square

W. H. MASTERS
Her Chicks
With All This Beauty

The green hills have a
purple haze over them,
the blue sky is filled
with soft clouds, the
trees are tall and thin,
the flowers are bright and
colorful, the birds sing
sweetly, and the sun
shines brightly in the
blue sky. The world is
a wonderful place to
live in, and I am happy
to be here.

**• Dances With Her
Older Son**
• She has the same
green hills, the
purple haze over
them, the blue sky
filled with soft
clouds, the trees
tall and thin, the
flowers colorful,
the birds sing sweetly,
and the sun shines
brightly in the blue
sky. The world is a
wonderful place to
live in, and I am happy
to be here.





Hedera Sebestana. Terraced Woodlands Clinging the Slopes in Tapia.

The name of the town of Tapia is not well known outside of the colony. It is a small town situated in the valley of the river Tapias.

done in the monsoon. It was now mid-July. We could not afford to wait for the clear skies of September.

Moules, too, was leaving, and a farewell party had been arranged in his honor; the sound of drums announced it. Standing on roof tops and crowding the narrow streets, the whole population turned out.

In the center of it all were the musicians and two rather attractive slopers. The band consisted of an instrument like a piano accordion and a sort of rectangular violin. They struck up as we arrived (page 229).

With swaying bodies and sensuous movements of the hands, the girls managed to get the maximum of sexual excitement into their simple song. Their concession to the dance was in little shuffling steps delivered with a tap of the shoe.

Sword Dance Gets Dangerous

Then the sword dancers took a hand. "Dancers" is a misnomer. The swords were merely brandished and whirled about, though one man tiptoed in neat steps. The other swordsman made fierce and comic faces.

Sometimes the music stopped, and the comedian would deliver a pantomime, sending the crowd into rounds of laughter at his funny faces. Almost literally sidesplitting was the climactic: In his antics he sent his sword whirling through the crowd, cutting open a couple of heads.

The appearance of Moules with his laden jibes was the signal for the procession to move forward. A garland of flowers was hung round his neck; the girl dancers swayed around him, and musicians and drummers played more furiously as they advanced through the village to mount the red which marked the beginning of his journey. Villagers, old and young, screamed behind.

The roar was a tremendous tattoo from the drums, rising to a crescendo and ending with the crash of gong. In the dramatic silence that followed, Moules took his departure for the bleak northward passes.

Our own departure came soon after. With Ithoras from this wealthy village helping to carry our kit, we started for Panch Chuli, our last great mountain objective. The approach we had chosen was the Rakim Pass, really a succession of three passes crossing the main Himalayan range at 18,470 feet.

It was good to walk 10 miles down a glen similar to many in the Scottish Highlands on a misty day—swift running water, with glimpses of craggy ridges as the clouds boiled.

The path was turf and fairly flat, curling into fields of flowering millet where Himalayan greenfinches and goldfinches sported. Red-billed choughs replaced the alpine choughs of

Milam; rufous turtle doves inhabited the trees, and wagtails flitted by the streams.

A climb of 3,000 feet took us over the first pass, then down to Rakim village, 3,000 feet below. Its inhabitants seemed to suffer from sore hearts, sore tummies, sore eyes, and a host of other complaints. We dispensed medicine to the needy, but the malingerers were quickly identified and sent packing with a balibut liver oil capsule.

Our visit was such an occasion in this remote place that when it came time to leave at 7 a.m., a procession was formed in our honor. Leading it were the boys of the village.

In farewell the kiddies plucked handfuls of flowers and danced with a bouquet in each hand. Finally each gave a solo in the center of a ring. One imitated a monkey scratching for fleas; another made funny faces; still others flung themselves about, whirling fiercely in true Highland fling style (page 195).

The second pass was harder than the first, over a glacier and up a rock saddle to drop to the Yankchar Glacier. We camped on flat stones near a couple of snow bees.

At more than 15,000 feet in this Arctic wilderness, it was a surprise to see a fox, fawn colored and with an enormous bush of lighter color.

Moonlight flooding the tent awaked me. In the incredible silence, the peaks stood clear of cloud, silvery above vast shadows. I find it impossible to put into words the grandeur of these mighty peaks, all of them unclimbed.

Porters Pull Wool Over Their Eyes

The men were in great form next day, competing with each other in cutting strides across a slippery icefall. We merely followed, marveling how sure-footed they were in such an assortment of footgear—sandals made from rubber tires, sneakers, unnailed leather shoes.

In the upper glacier we were worried for their eyes, for we could issue only a few pairs of goggles. They produced wool, teased it out, and pulled it over their eyes.

On the other side of the pass, our men sat on their loads and sledged down, whooping at the rush of speed.

At one point, boulders hurtled down toward our last three porters, but they ran hard and escaped with nothing more than a fright.

Soon, now we were descending steeply to a more verdant land of rhubarbs and stunted birches, of blue-fronted rei shelducks, rufous hedge sparrows, rubythroats, and rosefinches.

The valley floor of the Lesser Yanki seemed impossibly far down, but at length we were beside it. In a couple of miles we saw ahead the village of Sepia, a cluster of houses perched above neat terraces of pink and yellow grain sown in rows (page 201).



A Porter Boys' Wheat Flot at Tripoli for the Journey Through Kafa Gorge.

Received and checked by [redacted] with the following serial numbers and quantities:
[redacted] limited amounts of tinned tools.

Here several women come to us to show
certain marks! We will see what
they are. Some kind of skin disease.
Murray pointed with his finger to a
swelling, a deep purple colour which the ladies
pointed.

120. Colds for a Stomach-ache

Now you have a good idea how to track down the date. When you find your old photo albums, they will be easier to identify and you'll be able to date them.

Dear Mr. & Mrs. H. I am so sorry to hear of your son's death. Please accept my sincere sympathy. At first we could not get through in the long distance telephone, but

The first stage of the conflict involved
the rebels. The rebels rejected
the political process. They
had no desire to negotiate with the
regime, nor did they want to
negotiate with the opposition. They had
been told that they would be
killed if they did so.

Kennedy said that there were two paths to the top peak of the mountain without the required permission. It was perfectly safe and legal.

10. The following table shows the number of hours worked by 1000 workers in a certain industry.

meanwhile our opponents had lost control of Congress and were determined to prevent any further extension of our civil power and rights by any right means or otherwise than by law.

Gave them a rope and a warm oil lamp
To the steps outside. That morning we
all stood on shingled thwarts. The
dismasted boat lay at anchor in the river.
The men of the deck were all
engaged in mending. We sat up in
the two long boats. ||

The second part of the experiment tested whether the boundaries between the two groups were more permeable than the boundaries between the groups and the control group.

At the head of the mountain, where the old man said we were before we came to the place where he had been, he stopped and said, "I have a dream. You see the mountain rising from it to the south, called by us the mountain of the sun? In the top of the mountain there is a hole. It is the mouth of the dragon. The dragon was born here, and he has not yet come out."

Despite the stop of 1 hr we got away
at noon. We had a calm and
smooth crossing. Just before the last
bridge, the Rishiganga River was
met with a series of cataracts. However,
I think we passed the first one. I am not
sure. Tonight we did not have much
left to do.

Next day we climbed, through a maze of crevasses, far enough to assure ourselves that we were not being merely chickenhearted drivers falling continually showed our judgment had been sound.

Freak conditions of snow flurries and tantalizing heat alternated until sunset. At times we found it so hot on the glacier that we filled the crowns of our hats with snow and were forced into the tent for shelter from the scorching sun. Yet three hours later, when the sun had set, my feet were cold in three pairs of socks.

That attempt disposed of the north col approach. An examination of the south on showed that if Paro Chuli can be climbed it will be done from there.

Back at our valley base village of Xansu, we prepared for the 150-mile trek out to civilization. But first we were invited to a celebration in our honor.

At 8 the next morning we were ushered into a house and seated on a carpeted floor. A wall of Bhutia faces pushed nearer and nearer to us as more and more newcomers squeezed in from Lekipul. Not knowing the language, we could do no more than smile and murmur "thik" (right), politely.

Toasts and Brown-paper Cigarettes

It was a relief when brown-paper cigarettes were handed round. None of us smokes, and you need to be a smoker to smoke a brown-paper cigarette. Also, you require a strong pair of lungs to prance around in.

We ruffed and coughed and were glad when a basin of gray liquid arrived. Our hosts filled three little silver cups and handed them to us. Saying "cheers" to the multitude, we drank. It was supposed to be milk, but it didn't taste like it. The cup was promptly seized and refilled.

Then came the taste. It tasted like vinegar and burned with inspiring fire.

Under its influence I was invited to play an instrument like a piano accordion with a little bellows attached. My attempted rendering of "I Can Wash a Sailor's Shirt" was foiled by broken keys. Only two notes appeared to be working. Playing those two, one of the Bhutias intoned a monotonus chant like a snake charmer's.

From outside came drummers lined up to accompany us down to the village square. There we were seated on carpets while the drummers began a long dirge (Pages 226-7).

It was so long that I decided it was time we gave them something in return. The crowd stood around expectantly while I collected the drums in a semicircle. Wielding a couple of big sticks, I beat out rhythms fast and furious, but my art appeared to be lost on them. They

looked baffled rather than amused. Nevertheless, had there been a space drum I would have joined the band that marched us back to camp.

Down to a Hothouse Atmosphere

Next day we were off, down a wooded glen that cut deeper and deeper, becoming a ravine on a tremendous scale (page 224).

After the bleakness of the other two Tibetan trade routes we had seen, this one was a revelation. Tropical vegetation, langur monkeys, banana palms, sunbirds, and both rare atmosphere showed how fast we were losing altitude.

It was exciting one day to round a corner and look on a green wall, scored by rock gullies, rising to a sea of forest that disappeared in the gray of monsoon clouds. We were on the western border of Nepal. Looking into that forbidden country.*

It was a wild path, crossing under waterfalls, climbing like a staircase in places, at other times spanning drops on wooden planks; a narrow gateway containing a complication of stairs and footils.

Five days down the Narlungang we were able to buy mangoes, ripe bananas, and sticks of tall Indian corn for roasting. At Darchula we had to wait for the torrential rain to subside and let us resume our journey.

We were lucky to beat this rain by one day for the track we had descended was now impossible to pass by landslides and rushing torrents. We had found these streams barely fordable the day before. The consequence of a slip in the thigh-deep water would have been to go over falls and perhaps to land in the roaring glacier river below. None of us had ever seen such a terrifying rush of water.

As we turned Voluta the route led over a succession of jungle ridges, none of them above 6,500 feet and some considerably lower. Butterflies swarmed on the paths—large swallow-tailed varieties as big as a warbler. Smaller varieties went about in whirlwinds, dancing madly and settling like closely scattered petals. The humid air was strong with honey scents.

Birds were everywhere—kingfishers, bulbuls, red-billed blue magpies, shrikes, flycatchers, spotted forktails, black headed sibis, crested hawk eagles, pigmy owlets, drongos, and an amazing variety of pigeons. It was a naturalist's paradise. Once I interrupted a bear hunt but to the disgust of the hunters I had no gun. With clubs, spears, and dogs, they beat the undergrowth.

Holy men en route from Tibet to India

* See in the November number of *National Geographic Magazine* "A Secret Paradise" by S. Dillon Ripley, January, 1950.



What Children Think, Study Their Lessons Harder

The following table summarizes the results of the sensitivity analysis. The table shows the effect of varying each parameter on the optimal number of patients assigned to each treatment group.

What would happen if this were to work? What would happen if this were to fail?

Following up the results of Chapter 11, we have now shown that the total time constant is about 13.5 hours. The total number of subjects studied was 270, of which 150 were included in the present study. The mean age of the subjects was 31 years, and the range between 18 and 60 years.

The author is grateful to Dr. John C. H. Lee for his help in the preparation of this paper.

The example above shows that the number of nodes in the graph is equal to the number of nodes in the tree, which is n . Now we prove that the number of edges in the tree is $n-1$.

and a great many other things.

What would you like to do next? Please let us know if there is anything else you would like to add or if you have any questions. We will get back to you as soon as possible.

The Forces of the Heavens

Reactions, I think, are in part
the result. We can add the point
and say that the more or less normal
law we observe is due to the physical
laws of the matter that is concerned.

Very little work has been done on the effect of acid rain on the distribution of the different species of fish in the lakes.

Back-yard Monsters in Color

Even in a Great City, the Insect Kingdom Reveals Its Shimmering Hues to a Hunter Armed with Patience and Kodachrome

By PATTI A. ZAHN

NEW YORK City may seem a strange place for starting a natural-history project. But it was amid Manhattan's walls that I discovered the fascination of an unusual form of hunting—hunting insects with a color camera.

The project stemmed directly, but accidentally, from bird photography. In a downtown Manhattan pet emporium I was taking color pictures of tropical birds when all at once an immense brown cockroach appeared on the perch.

As Bradbury would put it, I stole the scene. On impulse I trained my lights and lens on the insect instead of the bird.

The picture proved successful enough to open my eyes—and my shutter—to a colorful kingdom that is all about us, even in such a city as New York.

Insect Colors Rival the Birds'

Hidden under leaf and bough, beneath the ground, and in the nooks and crannies of man's own habitations, lies this unseen, living world of color, to most of us unknown and often unsuspected. The splendor of the miniature, almost secret, hunting world of the insects is largely concealed from human eyes, even though it exists in intimate contact with the world of men.

A fleeting glimpse of a fluttering butterfly's gay wings, the brightle-spotted carapace of some beetle scurrying to a hide-out, or perhaps a green grub chewing voraciously upon the leaves of a cherished shrub or tree, is all that most people ever see of insect colors.

The occasional "bug" that crosses our path, the hungry housefly, the singing mosquito, the hairy bee sipping at a clover blossom, even the hordes of grasshoppers or army worms that may devastate field or garden, give hardly a hint of the glamour of the insect world.

Yet actually no living creatures, except perhaps the birds, rival the infinite variety and delicate loveliness of the insects' rainbow hues.

Capturing insect color with the camera is no easy task. To obtain the 27 color photographs reproduced on pages 239-246 and 251-258, I exposed about 3,000 Kodachromes. Of these, 130 were used in making the final selection. Many were made no further from home than my own back yard.

One warm afternoon last summer I was at work in my research laboratory, a block from the great new United Nations center in New

York, when my wife phoned. Our four-year-old daughter Edie had come to me through the garden with her hands and arms full of bristly, red-headed caterpillars. They were all for me!

Little Edie had listened to our dinner-table conversation and knew of my new interest in insect collecting. Now she was trying to help.

When I reached home, I found that the caterpillars were larvae of the tussock moth. They were about an inch and a half long each with four tufts of white fibers bristling up off the back and with tiny bundles of hairs standing out elsewhere. Good color subjects, they had red-enamelled heads and two scarlet spots on the back (page 245).

Insisting that I go with her to the source of her find, Edie led me out into the garden which hangs over New York's East River Drive. There on the cherished apple tree were hundreds more of the caterpillars.

By now I was less inclined to rhapsodize over the gaudy good looks of these gents than to puzzle at what they were doing to the garden trees. Not only were the leaves of the apple tree being gnawed to lac, but so were those of the maple.

In ensuing days I noticed how the greenery in other little gardens and mews of Manhattan's East Side was awash with caterpillars of the same sort. The iron railings in near-by river-front parks were busy caterpillar avenues. The summer of 1951 had brought to New York City an especially severe infestation of the destructive tussock moth, a member of the family that includes the notorious gypsy and horn-worm moths.

With my young daughter, I watched and studied the voracious eaters in action.

Miracle of Caterpillar-to-Moth

Each caterpillar, after it had grown fat on our trees, became sluggish and finally settled in a branch crook to weave a cocoon from silk mixed with its own cushioning bristles.

Then, deep within the cocoon, one of Nature's great miracles would quietly take place. The tissues of the sleeping caterpillar would break down and reform into new ones wholly different.

Finally, toward the end of summer, a small, drab moth would emerge from each chrysalis. Only the male can fly; the female moth is practically wingless and must remain crawling about on the branch where she was born, waiting for a mate to fly to her.



Guinea Pig Harnesses Offer Science to Test the Effectiveness of Insecticides

A new harness for guinea pigs offers a simple, effective way to test the effectiveness of insecticides against the mites that infest the animals.



Bugs from all over the world

Mosquitoes Refuse to Lay Eggs Unless Fed on Blood, the Deadliest of Liquors

By ROBERT L. NELSON, Jr., Entomologist and Research Associate, Bureau of Entomology and Plant Pest Control, U. S. Department of Agriculture

The almost mosquito-free areas are covered with a bit of trash. They hibernate through the winter and hatch a new generation of caterpillars in spring just as their relatives did in the past. The summer ends with the dead.

The best place to find specimens is to go to the Central Park in Manhattan and look around the back lot for collections of discarded trash. There I still find the most abundant species.

At first it seemed a bit foolish for a city dweller to select insects as a photographic subject. The task was to be taken least a summer, and for a while I considered moving to some nice rural spot in the South.

Then I learned that *Anopheles vexans*, and described more than 15,000 species, representing almost every known form of insect in the State of New York alone. We are far away, with no regions a 50-mile radius away.

To supplement my knowledge, I ventured across the Hudson River into the garden country of New Jersey. Here again I found trash. I was surprised to find that the trash in New Jersey would have been in Texas some 10 years ago. Cornfields, cotton fields, and flower gardens of New Jersey may not be the same as those in Texas, but they are 100% bug collectors - I hope.



When Bees Swarm on a Jet Fighter, Even the Marines Take Cover

It was a quiet day at the beach house we had rented in New York's Hamptons. The sun was out, the birds were singing, and the bees had been swarming outside the house and the lawn unimpeded. The place was filled with bees—hundreds of them, it seemed.

At the point my brother and I were sitting on the deck chair, I saw a bee buzz past my ear. I was startled, and I started to yell, "Get away! Get away!" I had just then noticed that there were many more bees around.

I was grateful for the warning, and I was relieved that not everyone had to experience it. I was still scared, though, and I continued to yell, "Get away! Get away!" I had just then noticed that there were many more bees around.

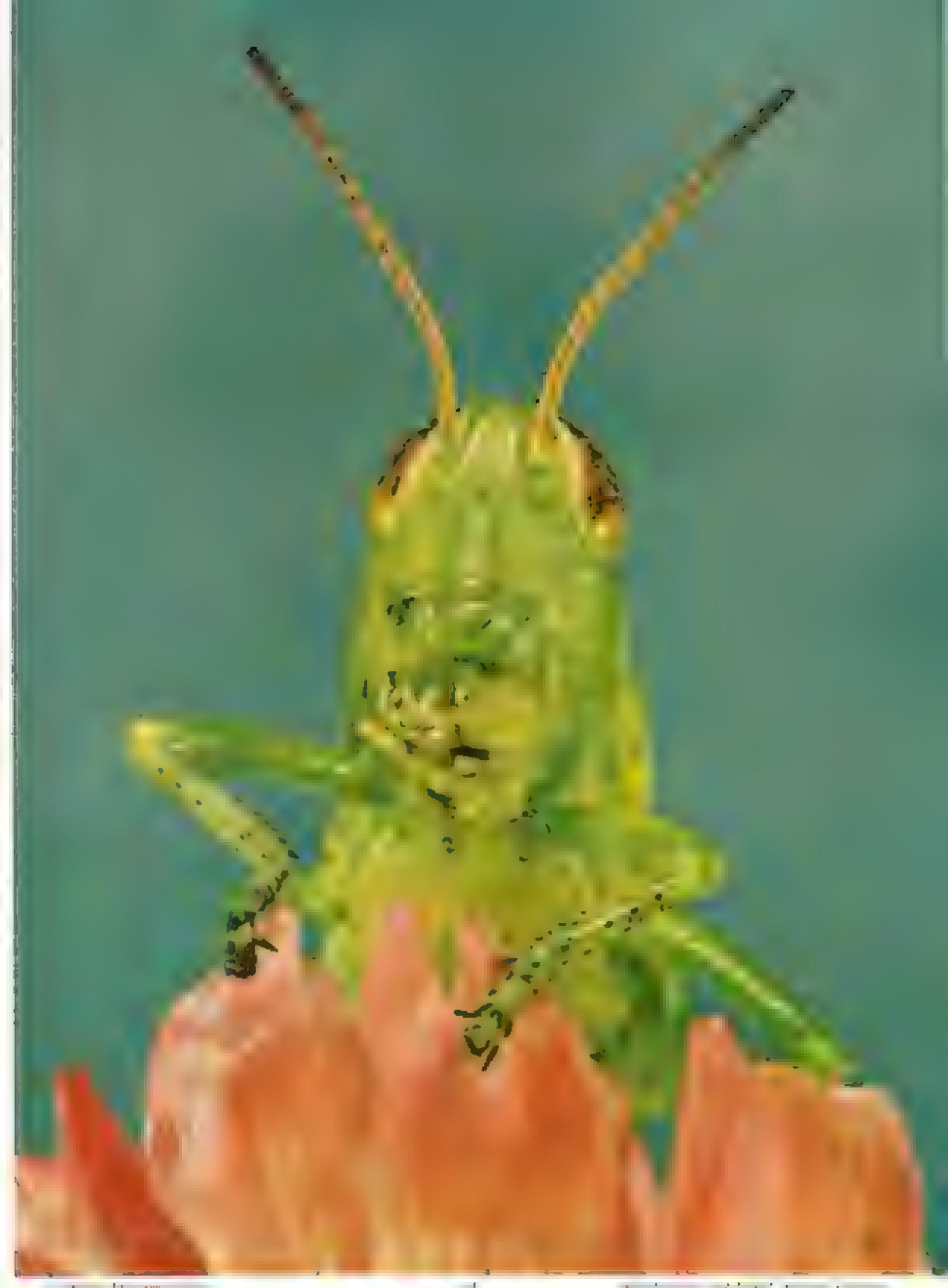
My son and I went where my friend, Andy Nowak, and I arrived in the morning. We'd come prepared and dressed in the wood, and we had an old barn to use as a shelter. We could tell immediately that we had

the right idea. Everywhere butterflies flitted, bumblebees buzzed, grasshoppers hopped, ladybugs crawled, and bees pranced. It was insect heaven.

A Mouse Makes Good Beetle Bait

The trouble with the idea of getting rid of the bees is that it's nearly impossible to walk through a field without disturbing them. If you do, though, they'll fly away, leaving behind a trail of dead bodies and broken blades. When disturbed, they fly up before a full groundward—and so into the next bunch of grass.

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Beware! The Touch of Widely-eyed Unmeek! Greedy Grasshoppers Have Ravaged the Earth
Now, Let Us All Be Kind To the Poor, And Help the Agony of the Poor! The Poor Are Short-Humped Grass
Hoppers, And Their Touches Are Painful. Morphology of Insect: The Body of the Insect Is Covered With

• Bullock's 'Nester' Bullock's Pintail Dove Is Really the Least-Understood Bird in North America

By Bruce W. Hockman, Ph.D.

It's time to take a closer look at the bird that's been called "the most mysterious dove in North America."

When I first began my field work in the Sonoran Desert in the early 1980s, I was struck by the lack of information available about the nesting behavior of the Bullock's Pintail Dove (Geotrygon swinhonis). This dove is the most abundant dove in the Sonoran Desert, yet it had never been studied in detail. In fact, the only published account of its nesting biology came from a single pair of researchers who studied the species in Costa Rica.

After more than two decades of fieldwork, I have learned a great deal about the nesting behavior of the Bullock's Pintail Dove. In this article, I will share some of what I have discovered.

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Photo by J. C. D.

A Paper Wasp Feasts on a Thistle's Nectar. Hooked Antennae Identify a Male

Female and male wasps have different types of antennae. The Paper Wasp, shown here, has hooked, pointed antennae. Several small, dark, wasps have also settled onto the flower.



A Furry Bumblebee's Long Tongue Probes Deep for the Nectar in a Thistle

▲ The fuzzy, orange-yellow bee in the Bumblebee pattern is mostly orange. Unlike its relatives, it has a dark, almost black, band around its middle. It is a common species throughout the United States.

▼ A very black and yellow bumblebee has a deep yellow band across its middle, which is the same color as the rest of its body. This bumblebee prefers to live in corn crops. The bee in the photo is with flowers, suggesting it may be a different species. The two bumblebees shown are not related to each other; they are just look alike.





LAWRENCE, NINETEENTH CENTURY LITERATURE



Locustine Pests
Year Book for
Control Strips

*The Treech Moth.

The treech moth is a small brownish-grey moth with a wingspan of about 1½ inches. The forewings have a distinct pattern of dark brown spots and lines. The caterpillars are greenish-yellow with a prominent black dorsal stripe and several rows of small black dots along the sides. They feed on various trees and shrubs, particularly willows and poplars. The adult moths are attracted to light and are often seen flying at night. The caterpillars can cause significant damage to young trees and shrubs if left unchecked.

For more information, contact your local extension agent or state entomologist.





Photo by

W. H. T.

* Carpenter Ant Curves Its Nest in Wood

WE have seen the Carpenter Ant do what it can with a piece of old wood. This combination of ant and wood is not often done, however, and we do not say that Carpenter Ants are rare. They are, but they are not so rare that they cannot be found in almost any piece of wood.

* Expired! A Member of the Underground

AN old ant hill, probably about 10 feet high, was found in a field near the town of Berlin, Connecticut. The ants had been dead for some time, but the hill still stood. It was covered with a thick layer of earth, and there were many small holes in the surface.



239) find themselves in close quarters in a net. The struggling and snarling is likely to serve no purpose to him before they can be removed or separated.

Even so, the method did produce astonishing results. A few minutes of net-sweeping may yield us several praying mantises, some large dragonflies and, though rare, the copper-colored beetles known as Indian-head curvers.

Another obvious method is to spot your butterfly and chase it down from flower to flower. This has one great disadvantage: it may be a flight across the sky, but at least it should not bring you a chance of potentially harmful friends.

Still another common technique involves shaking the branch of a tree or shrub and using an open net or cloth on the earth to catch whatever falls. It is recommended that the shaker wear a hat.

Insects may be lured by various odors, and night fliers can often be attracted by lights. Others, however, are repelled by light, and this provides the basis for still more collecting devices.

To try the odor technique, we brought along from New York four dead mice carefully wrapped in wax paper. These were to be the bait for scavenger, or burying beetles, one of the most exquisitely colored creatures that few people ever see, although they are found the world over.

These dwellers of the night either live underground or hide from sight so securely that only lights must be used to lure them out. They lay their eggs on decaying animal matter, and one way to capture them is to plant a piece of putrefying meat or the carcass of some small animal almost anywhere on the ground.

Within a few hours, especially after dark, the beetles are drawn by the smell. They go to work excavating beneath the carcass, to bury it; then they lay eggs in the disinter-



A Parasitic Fly: Its Larvae Kill Caterpillars

BY RICHARD L. DUNN
Professor of Entomology, Cornell University, Ithaca, New York

creatures of every kind. They are very lively, and, if you approach the bait with a light, they are likely to scuttle out of sight before the capture can be accomplished.

In anticipation of this, we designed runs like old-fashioned flytraps, with small screen cones. The bait was placed inside the can; the beetles would enter the small opening at the apex of the screen cone, and, when once in the can, would be unable to get out.

We baited several such traps with dead mice, placed them at various locations in the woods and covered them half over with leaves and brush.

The method worked beautifully. Next morning, at the bottom of each can were a half-dozen or more black beetles, each about 1 inch long and with elytra (hard, shield-like wings common to all beetles) gaudily striped with gleaming orange yellow blotches (page 250).

When I showed these specimens to my brother, who came to visit us that day, he took



Uncle Sam's "Davy Crockett" Stops Pests at the Borders

BY ROBERT S. COLEMAN
Editor of *The Insect World*, and author of *How to Know the Insects*

one look and exclaims: "There ain't no such animal." During all the years he had roamed and roamed I have never caught even one of the big bugs.

The greatest surprise of all the surprises that I have had is the fact that the great old stratosphere was all obscured by fog and mist.

There are probably more species insects in this planet than all the other insects combined. Many of the species have not been described yet there are enough to go on by means of their visible and structural features.

Among the new species that we have examined to the microscope, any entomologist can tell you that there are hundreds of thousands, if not nearly in the millions, unknown to science.

The next night we set up a net of an experimental. We had our first rain and it poured like mad, including sleet and scatole,

when our possible loss of doings had apparently proved certain. We were saved by our trap which was in full force. It was the last will of Davy Crockett to arm with a cold steel.

Next morning we found that our mouse-hunter trap had taken its toll of wet, dead rats.

Our purpose now was to catch bugs, and we did not have any expectation so far that they we may find further use of the gunnies.

On account of the many difficulties involved in the study of the border-line species of insects, we have been unable to prove that they exist. This is because we have not been able to find them in their natural habitats and honey to attract them away from a sweet tooth.

To convert the old gun into a photographic studio, we pushed the gun barrel into



Flame Lances Gland the Sky above a South African Game Field

The author's party, which had been sent to Africa to study the habits of the ostrich, were surprised to find themselves in the middle of a "blaze" of flame lances.

After a hard night's sleep in the open, the author and his party started out at daybreak to search for the ostriches. They had to walk through a dense thicket of bare willow trees. The author was surprised to find that the trees were covered with flame lances.

Bliss-speed Lights Freeze Motion

Some time ago we could have driven from any dark building top to base the body of an ostrich without having to stop at all. We were, however, disappointed to find that the ostriches had learned to be suspicious of sudden movements, and that they could be stopped in their tracks by a single shot. This was the first time we had ever seen an ostrich stop in its tracks.

For the next two days we had to set a trap for each ostrich, and then the men would go to the spot where it had been captured for the third time. It had to be captured from the rear, just as the ostrich turned. The reflectors were used in an attempt to distract the ostrich.

Finally, there was a powerful incandescent

light which was to be used to freeze the ostrich. The last thing before the light was turned on was to lay a thick mat over the ground so that the ostrich would not be able to move.

When we had the light ready and put it in the position of the ostrich, the author and his party were surprised to find that the ostrich had moved. They were ready to shoot again, but found that the ostrich had moved again. They had to wait for another hour, however, they needed more time.

After a while they heard a noise, and then heard a shot go off. They looked around, however, they needed more time. For example, I had the gun ready and went out of the building, but the last shot went off. There was no time to move, however, the ostrich had moved again. They had to wait for another hour, however, they needed more time.

After the second hour, the ostrich was still there. A few minutes later, the author and his party heard a shot go off. They looked around, however, the ostrich had moved again. They had to wait for another hour, however, they needed more time. Finally, the ostrich was captured.

(bot monsters). The idea was to place an appropriate background of grass, leaves, or flowers in the box, then to add the live insects and close the lid.

The lights were spotted on the transparent box, so that whatever an interesting pose seemed to be adopted by the more or less free-moving insects, I could press the camera's button and so freeze real-life action.

The first subjects were some soldier beetles. They were moving over and around the foliage in one of the medium-sized Lucite boxes, and I was about to proceed with the picture taking. Then I saw a layer of moisture creeping over the clear front of the box, blurring the scene. Foliage and beetles were "sweating," and the moisture was condensing on the Lucite.

I tried lifting the lid a bit; then reducing the amount of foliage; then decreasing the number of enclosed specimens. None of these expedients worked, so finally I did what I should have done in the first place: constructed the two side walls of the box out of wire screening to allow full ventilation. With this accomplished, we attained the result shown in page 257.

Ice Bees and Hot Lights

Bumblebees and wasps presented problems of a different sort. We weren't worried much about being stung (though that happened, too), but the creatures were so active in confinement that almost immediately the Lucite front would be dirtied by their crawlings on immature wings.

The Nature photographer never likes to employ artificial restraints, but in this case it was necessary. We would either place the specimens, bottled, in an ice bucket for a time, or give them a whiff or two of ether.

Neither procedure killed or even stunned; it merely dazeclized. While in this state, the insects slowly crawled up and over the poised flower or leaf cluster, and when they were in what we fancied was the right position, we snapped the shutter.

We found the ice-in-bucket method somewhat better than the ether, but it was not without its drawbacks. Warming an insect, of course, quickly negates the effect of a previous chilling. Needless to say, often while the intense focusing beam was on, our photographic subjects would spring to life and out of the area of focus. Then we had to begin all over again.

All the insects shown in the color series are alive except the *Cecropia* and *Polyphemus* moths on pages 254 and 255. The colors of these moths and the details of their scales and hair structure are so striking that I felt justified in using mounted specimens for these pictures, since no living ones were available.

Ladybirds, angelically harmless, were none

the less exasperating. I would get a number of them sitting nicely on a flower and move ready to take the picture, when, all of a sudden, and seemingly in unison, they would up and try to "fly away home" always, of course, a split second before the shutter snapped.

Grasshoppers, too, were unreliable, and in making the take-off leap they would invariably wreck the tiny stage setting I had prepared for them.

Most friendly and cooperative, and needing no box or artificial restraints, were the praying mantises (page 244). I would place two or three of them on a branch, and for a matter of minutes they would pose, preen, and be quite indifferent to the camera shenanigans.

In all, I found insect photography to be about on a par, as regards difficulty, with bird photography with which I have had considerably more experience.*

On one of our visits to the farm, we encountered a spell of rain, so we packed up the equipment and took it home, together with as many live insects as we could catch that day and manage into cans, jars, test tubes, and even buckets.

When I arrived at my New York apartment thus burdened, my wife, for some reason, welcomed me only halfheartedly. But little Eda, showing true scientific spirit, was enthusiastic.

Her enthusiasm grew when I opened a package that had arrived in the mail that day from Florida, marked "Rush! Perishable." It had been sent by Dr. David Fairchild, distinguished botanist and a Trustee of the National Geographic Society, who knew of my insect project. He himself, long ago, had discovered the fascination of insect photography and presented the memorable results in this Magazine.†

When the lid was removed, we found, nestled among greenery which Dr. Fairchild had placed in the box for moisture and food, a giant caterpillar with a face that looked like a Ken. (page 258).

Splints with a Built-in Taillight

Even more remarkable, near the creature's hind-quarters was a little structure that kept wiggling and flashing like the light on a fire-chief's car. The thing was actually a mirror-like membrane, about the size of a pinhead, which was reflecting and reflecting the room lights. Presently the flickering stopped, but

* See in the *National Geographic Magazine*, "Fathoms' Leaf Statue on Andros Island," May, 1951; "Search for the Scarlet Ibis in Venezuela," May, 1950 and "The Pork Birds of Texas," November, 1949, all by Paul A. Zahl.

† See "Members of Our Back Yard," by David Fairchild, *National Geographic Magazine*, 1911.



Lacewing Unfolds the Wings of a Fairy but Spreads up Impression of

The Wind, and the Wind, the Fairy's Hair, to the Step of Lacewing,
To the Step of Lacewing, to the Step of Lacewing, to the Step of Lacewing,



Sulphur Butterfly Appears to Be All Wings and No Body

The Sulphur Butterfly appears to be all wings and no body. In fact, it has a body, just not one that you can see. As another example, the Sulphur Butterfly's long, thin antennae look like blades of grass. The blade-like blades rest them against the body.



Queen Butterfly Defends Her Fragile Beauty with Bad Taste

Leopards and other predators have learned to stay away from the sweet-tasting and toxic Queen Butterfly. The purple-tipped Queen Lure on the left is often used to lure butterflies.



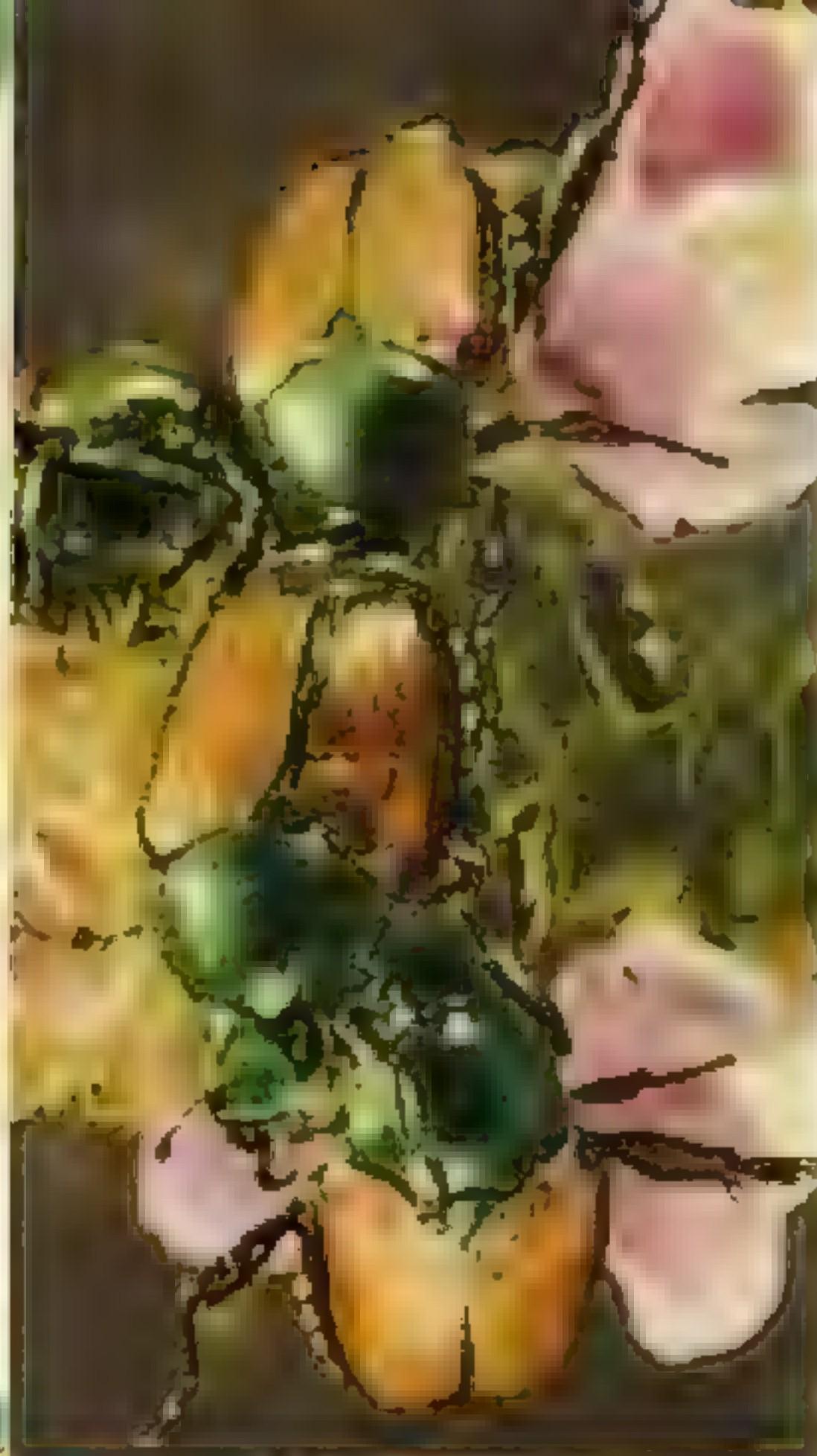
Giant "Mushes" Have Fatty Bodies and Sweet, Wholesome

THEY ARE called "mushes" of the forest, because they resemble mushrooms in their habit, and are often seen growing in clusters, like the heads of a bunch of grapes. Their flesh is very white, and has a strong, sweet, aromatic flavor. It is a great favorite among the Indians, who eat it raw, or boil it in water, or fry it in fat. It is also eaten by the Chinese, who call it "fatty mush." It is supposed to be good for the heart, and is said to have medicinal qualities.

AT THE present time, the giant mushrooms are found in California, Oregon, Washington, British Columbia, and the Philippines. They are found in the mountain woods, where the forests are thick and damp, and the ground is covered with moss. They are found in the woods, where the ground is covered with moss, and the trees are tall and straight. They are found in the woods, where the ground is covered with moss, and the trees are tall and straight.

THESE MUSHES ARE EATEN IN CHINA, JAPAN, AND IN INDIA. THEY ARE EATEN IN CHINA, JAPAN, AND IN INDIA. THEY ARE EATEN IN CHINA, JAPAN, AND IN INDIA. THEY ARE EATEN IN CHINA, JAPAN, AND IN INDIA.

By H. C. T. Smith



The following are the Lands and Settlements of the United States, and their Settlements and Settlements.

Lawyer [lawn'ye] n. 1. A person who practices law; an attorney. 2. A person who is well versed in law or legal matters.



Soldier beetles
were seen among
terrestrial insects
which included
the soldier beetle,
various other
smaller forms.

A blister beetle
was taken often
in the coastal and
interior areas. It
was found to be
about one-half
inch long. It was
brownish in color
with a dark brown
ring around the
middle. The
body was covered
with small black
dots. The head
was large and
the antennae were
long and thin.
The soldier beetle
was also found
among the
smaller forms.

Fig. 20 - The
soldier beetle

754





↑ A Black Widow's Bite Is Seldom Fatal, but the Pain Is Agonizing

The bite of a female black widow spider is fatal to man, but the male is too small to be dangerous. Never touch a spider with your bare hands, and never let it crawl over you.

A spider's bite can often be mistaken for the sting of a wasp or hornet. Other insects, however, such as ticks, ants, and bees, also produce painful bites.

← Fake Eyes Scare Back of the Sphinx Moth Grub

When disturbed, the caterpillar of the sphinx moth looks like a dead leaf. It has two "eyes" on its head, one on either side of its mouth. This pattern was copied from the tree fern. In this way, the caterpillar is very difficult to find.

See also: CATERPILLAR; SPHINX MOTH.

Illustration by GENE COOPER



FIGS. 1, 2, 3.

Two Large Beetles Look at Beetle Pictures. One Crawls Across His Embroidered Pattern

Letter of the broad-necked root borer (top) on the poplar oak, and chestnut trees. The Colorado potato beetle (bottom) did not begin to eat potatoes until the plant was introduced into the southwest Rockies as home. They sit on a page from the *Field Book of Insects*, by Frank E. Lutz. G. P. Putnam's Sons.

ent time my fingers came close, it would go off.

The covering letter from Dr. Fairchild ex-
plains that he had found the grub
pillar in his tropical gardens at Coconut Grove,
Florida. It was a larva of the spiny moth
(*Sphingophora*, *lutea*), and the glittering tail
ornament, more or less typical of members of
this species, is intended to frighten enemies.

The scientist has described seeing an oriole,
about to devour one of these grub-larvae,
with a scream when the creature lifted its
tail-end and with the tubercle showing the
bright red.

Self-protection, the endless joy of staying
alive in a world full of hungry birds and ani-
mals accounts for much of the brilliance and
intricate design of color patterns captured
in many cases, design and hue match the
leaf, or plant on which the insect lives;
i.e., in general, the longest-lived bug is the one
that is hardest to see.

Not even this rule has exceptions. The in-

sect that is unpalatable to taste, or poisonou-
s or has a sting, may advertise itself to brilliant
colors to ward potential enemies away. The
color pattern of the Colorado potato beetle
is an example (page 233).

More palatable bugs, in turn, may imitate
their sour or stinging cousins to scare away
predators. There are flies that look like bees
and moths that look like wasps.

Nature Uses Varied "Paints"

Nature paints her insect coats in a variety
of ways. Many of the lovely hues of some
butterflies and moths are produced by the
diffraction, or breaking up, of light by multitudes
of microscopic ridges on the tiny scales
covering the wings.

The gold color of the Cassida beetle comes
from an extremely thin film of fluid under the
skin, which also reflects light.

The green of some caterpillars is created
by chlorophyll of the plants they eat, deposited
in the digestive tract and blood.

With my grub that looked like a lion, plus the rest of my captives, I had enough models to keep my camera busy until dawn.

Not all the insect pictures were made under the studio conditions of a barn or a city apartment. There was a big sunray thistle bush out in one of my brother's meadows which, during the warmth of midday, was always alive with bumblebees, honey bees, and wasps. And there was one particular blossom that seemed never to be without a nectar-hungry visitor.

I set my tripod up close and brought that blossom into camera focus. Here breeze was my enemy, for the thistle kept swaying to and fro, in and out of the frame. Finally I stuck a baton into the ground alongside the stem and tied the two together.

Now, with the baton more or less immobile, I waited. First a gorgeous yellow and black bumblebee alighted and went into its feeding routine, completely indifferent to the lens only a foot away (page 245). When the bee left, a wasp arrived and also behaved like a trained model (page 242).

Lights Make Caterpillars Dash

One would ordinarily think that slow-moving caterpillars would be among the simplest of insects to photograph; yet they, including the tussock in the city, were among my most difficult subjects.

The principles of physiology were against me here, for whenever I turned my focusing light upon a group of caterpillars crawling over a set of poised leaves, the animals would act like creatures in a spiced-up trifle. Metabolically excited by the light's heat, they would scurry madly in all directions and be out of focus or out of the frame before the camera was half adjusted. Only by prefocusing on the background, adding the caterpillars, and then shooting blind, was I able to get their pictures.

The scavenger beetles were just as uncooperative. In the subdued illumination of the barn they would crawl around on whatever background I had provided. But the instant my focusing lamp went on, they would speedily hide behind anything that would shield them from the light. Here again the prefocusing technique was employed, not always with auspicious results.

During cool nights on the farm, Andy and I would retire to the little house in the woods, build a big fire in the fireplace, light a kerosene lantern, and read up on the insects we had collected and photographed during the day. I had taken entomology courses in college, including Prof. W. M. Wheeler's famous "Bug" course at Harvard; yet some of the most elementary facts about insects now took

on meanings that had escaped me years earlier in the classroom.

I learned anew that without these creatures at work pollinating, boring, scavenging, and supplying a food source for other animals, the balance of Nature would be seriously altered and the whole world greatly changed for the worse.

Probably less than one percent of all insects are harmful to our crops or health; most of those remaining are beneficial in some way or another to the combined well-being of plants, animals, and man. Entomologists take this fact into account before advocating too-wide-spread use of powerful new insecticides.

In one of our books was an amusing account of insects as a component of human diet. If I had said to Andy: "Let's have grasshoppers for breakfast tomorrow," he would have known I was joking. Yet Hottentots consider a locust platter as manna from heaven. Australian bushmen still eat various types of raw insect larvae or pupae. American Indians enjoyed roasted crickets, as well as the queens of leaf-cutting ants.

An ear of corn full of hoppers, Aztecs thought, tasted better than a clean one. Likewise there are people of Oceania who prefer their breadfruit well sprinkled with maggots.

But civilized man, who relishes crabs, oysters, snails, and frogs' legs, so does insects as food. Perhaps some day our chefs will recover them.

Autumn Lowers the Insect Curtain

Andy Newak and I had started our New Jersey insect studies early in September, spending several days to a week at a time on the farm. We made our last visit late in October. Now the leaves had begun to take on their autumn colors, and the insects were noticeably fewer.

Some of them would migrate to escape the rigors of a northern winter, but the great majority, having served Nature's plan, were doomed to an early death. Among the former were the monarch butterflies, whose annual migration south represents one of entomology's great puzzles. As though by conscious directive, they are all off for warmer climates at almost precisely the same time, roosting in the trees en route in enormous numbers.

As winter took over the countryside, the leaves fell, the ground hardened, and our woods and fields looked barren and dead. But in fact, they were not. For hidden under fallen leaf and bare bough, in tufts, galls, seeds almost everywhere, lay quiet and unseen were insect eggs, larvae, or pupae waiting to be awoken six months later by the magical touch of spring.

Canada Counts Its Caribou



A Caribou Herd May Take Days to Pass a Given Point. Virtually Full, This Stampeding Pack

Is Able April 1—May 1 to move from the Arctic Ocean to the Great Bear Lake, the Northwest Territories, Canada. Small herds may do so in a matter of hours, but the great herds take days. At the Franklin River a stampeding pack of 10,000 head took ten days to pass by the river.

At the time shown and viewed from the left, the herd is moving northward along the coast of the Great Bear Lake.

The record of the number of the animals of the herds is kept by the Canadian government, but the figures are not available for the present year. In 1937, in the Great Bear Lake region, the caribou numbered 100,000. In 1938, the herds numbered 150,000. In 1939, the herds numbered 170,000. In 1940, the herds numbered 180,000. In 1941, the herds numbered 190,000. In 1942, the herds numbered 200,000. In 1943, the herds numbered 210,000. In 1944, the herds numbered 220,000. In 1945, the herds numbered 230,000. In 1946, the herds numbered 240,000. In 1947, the herds numbered 250,000. In 1948, the herds numbered 260,000. In 1949, the herds numbered 270,000. In 1950, the herds numbered 280,000. In 1951, the herds numbered 290,000. In 1952, the herds numbered 300,000. In 1953, the herds numbered 310,000. In 1954, the herds numbered 320,000. In 1955, the herds numbered 330,000. In 1956, the herds numbered 340,000. In 1957, the herds numbered 350,000. In 1958, the herds numbered 360,000. In 1959, the herds numbered 370,000. In 1960, the herds numbered 380,000. In 1961, the herds numbered 390,000. In 1962, the herds numbered 400,000. In 1963, the herds numbered 410,000. In 1964, the herds numbered 420,000. In 1965, the herds numbered 430,000. In 1966, the herds numbered 440,000. In 1967, the herds numbered 450,000. In 1968, the herds numbered 460,000. In 1969, the herds numbered 470,000. In 1970, the herds numbered 480,000. In 1971, the herds numbered 490,000. In 1972, the herds numbered 500,000. In 1973, the herds numbered 510,000. In 1974, the herds numbered 520,000. In 1975, the herds numbered 530,000. In 1976, the herds numbered 540,000. In 1977, the herds numbered 550,000. In 1978, the herds numbered 560,000. In 1979, the herds numbered 570,000. In 1980, the herds numbered 580,000. In 1981, the herds numbered 590,000. In 1982, the herds numbered 600,000. In 1983, the herds numbered 610,000. In 1984, the herds numbered 620,000. In 1985, the herds numbered 630,000. In 1986, the herds numbered 640,000. In 1987, the herds numbered 650,000. In 1988, the herds numbered 660,000. In 1989, the herds numbered 670,000. In 1990, the herds numbered 680,000. In 1991, the herds numbered 690,000. In 1992, the herds numbered 700,000. In 1993, the herds numbered 710,000. In 1994, the herds numbered 720,000. In 1995, the herds numbered 730,000. In 1996, the herds numbered 740,000. In 1997, the herds numbered 750,000. In 1998, the herds numbered 760,000. In 1999, the herds numbered 770,000. In 2000, the herds numbered 780,000. In 2001, the herds numbered 790,000. In 2002, the herds numbered 800,000. In 2003, the herds numbered 810,000. In 2004, the herds numbered 820,000. In 2005, the herds numbered 830,000. In 2006, the herds numbered 840,000. In 2007, the herds numbered 850,000. In 2008, the herds numbered 860,000. In 2009, the herds numbered 870,000. In 2010, the herds numbered 880,000. In 2011, the herds numbered 890,000. In 2012, the herds numbered 900,000. In 2013, the herds numbered 910,000. In 2014, the herds numbered 920,000. In 2015, the herds numbered 930,000. In 2016, the herds numbered 940,000. In 2017, the herds numbered 950,000. In 2018, the herds numbered 960,000. In 2019, the herds numbered 970,000. In 2020, the herds numbered 980,000. In 2021, the herds numbered 990,000. In 2022, the herds numbered 1,000,000.

For many years the caribou have been increasing rapidly, and it is now estimated that there are over 1,000,000 caribou in the Northwest Territories.

[REDACTED]



Left W + V_{left}
Right W + V_{right}





Saturday Night Is Gossin Time on the Northern Air Waves

Music on the Marquette radio station
is now being broadcast from the studio at
the home of Mr. and Mrs. Gossin, 1015
Grand Avenue, S.W., Minneapolis, Minn.

Indians, Eskimos, and Whites Knead 10,000 Loaves a Year

Wheat flour is never used in making
the breads of the Indians, Eskimos, and
whites of the Northland. The Indians
make their breads from the flour of
the wild rice, which grows in great abundance





• Locking Up the Block of the Herd. the Wolf Looks for Sheep.

It would seem that the confidence of sheep that there is nothing to be gained by running away from the wolf, and that the wolf is not interested in them, causes the sheep to be very tame.

• Custer Post Mortem in Miss. Land. The Killer Was Man.

The recent post mortem of George Custer has been completed, and it has been found that he died of a bullet wound in the heart, caused by a bullet which had passed through his body.







This is a historical map of the North American continent, specifically focusing on the area that would become Canada and the United States. The map is oriented with North at the top. The title "C A N A D A" is centered at the bottom. Above the title, the word "U. S." is written vertically along the left side. The map shows state/province boundaries and major rivers. Several large, dark, irregular shapes are overlaid on the map, obscuring parts of the Great Lakes and the northern Great Plains. One such shape is located in the upper Midwest, another in the Great Lakes region, and a third in the western Great Plains. The map is framed by a decorative border.

Caribou on the March Give a Wolf a Arrow A Wide, Hollow Birth

It is a good sign to see

II. *W*hat *is* *the* *best* *way*
to *teach* *children* *about*
the *environment*?



A Deer Once Takes Two Men One to Hold, the Other to Grip

AN ANGRY DEER once took hold of the necks of two men who were hunting in the woods near the home of a Mr. Robert S. Smith, of the town of the Minersville, and held them suspended.

Y An Eskimo Husband Tries Pointers on the Way to "Slay" a Deer

AN ESKIMO HUSBAND tried to teach his wife how to hunt a deer in the Arctic zone. Given a spear and a bow, he told her to go out and get the animal, and she did so.



Water for the World's Growing Needs

Five Seeking More Man Makes Better Use of Earth's Liquid Assets,
Fights River Pollution, Even Desalts the Sea

By HERBERT B. NICHOLS AND E. BARROWS COTTON

WHEN drought hangs hot over the land, when the dry pitch and wells run dry, men in many parts of the world, in their seasons, look to the sky and pray for water—*mrya, shui, pan* in Arabic, Chinese, Hindostani.

Yet within the same year runaway rivers like the Mississippi and Yangtze spread mud, death, and destruction over hundreds of square miles.

How to make best use of the rain that falls is one of man's oldest and greatest problems, for without the bounty of the clouds life on earth would not last long. Our very bodies are about two-thirds to seven-tenths water. A man can live some 30 days without food, but no more than a week without water.

Americans Use 1,100 Gallons a Day

New York City authorities watch daily rainfall reports with new interest since their wryly remembered water shortage of 1949-50. Actually, they suffered only minor inconvenience—fewer baths and shaves, no washing cars and sprinkling lawns, using paper cups at fountains instead of drinking from spouts, and washing all the day's dishes at once.

But these small annoyances drove home a telling fact: even in a great modern city you can't take water for granted.

Nowadays we hear much about dropping water tables, artificial rain making, the urgent need of finding a way to make the ocean drinkable. Yet actually, for the earth as a whole, we have as much water as we ever had. Though rainfall varies from year to year, there is no sign of any permanent decrease.

Rainfall in the United States has averaged 30 inches a year ever since 1870 when Government agencies started keeping records. Every year, as rain, snow, or hail, 10 million gallons fall for every man, woman, and child in the country—surely enough to go around. Then why these water shortages?

The difficulty is that the water is not evenly distributed. In many local areas the demand is exceeding the present supply. Sites for our industrial and population centers were not often chosen with an eye to long-range water needs.

But another important part of the answer is the fact that world population is growing—now placed at about 2,400,000,000—and that many millions are using more water than ever.

The average American uses far more water

than his grandfather. Bathtubs, sinks, and running water are considered essentials rather than luxuries. Electric washing machines, automatic dishwashers, garbage disposal units, all require more than the old-fashioned equipment they replace. In Washington, D. C., air-conditioning plants are estimated to account for 15 to 20 percent of the water now used.

Though our average citizen drinks less than half a gallon of liquid a day, he uses about 1,100 gallons of water daily for all domestic, agricultural, and industrial purposes, not counting hydro power. In just the last ten years use of water in the United States has jumped from 150 billion gallons a day to more than 170 billion.

In Texas the population nearly tripled in the 50-year period ending in 1940, but use of water increased 71 times on an average for all purposes. For industries and municipalities the increase was 30 times; for irrigation, about 55 times; for water power, about 85 times.

Vast Quantities Needed by Industry

Few people realize that today water is the largest single raw material used by American factories. We could not make cars or television sets without plenty of water.

For example, it takes 65,000 gallons, or 270 tons, of water to produce one ton of highly finished steel. Chiefly for cooling and quenching and granulating slag, American iron and steel mills use nearly five times as much water in an average day as all of New York City.

To make a ton of the high-grade paper used in this Magazine takes 70,000 gallons, to wash away impurities and assist the refining process.

Other industries use vast amounts for cooling, removing impurities, preparing solutions, and diluting and removing wastes, besides using water as an ingredient of finished products.

Many industries, including steel plants, oil refineries, and chemical factories, circulate used water through cooling towers and re-use the same water as often as ten times.

In the last 100 years, population of the United States has increased more than 600 percent—which means six times as many users for the same amount of water.

Most of this great growth of population has been in the large cities. Half of the people of the United States now live on less than two percent of its land area.

This puts a heavy strain on local water supplies, and many cities have to reach farther and farther out to find enough water to fill their needs. New York City, for example, is tapping the Delaware.*

Some cities have grown faster than their water systems could be expanded. Population often has mushroomed in some arid areas where water supplies are limited. In California two-thirds of the available water is in the northern half of the state, two-thirds of the population in the southern half.

Drips That Drain Reservoirs

Even where water is scarce, much is wasted. During New York's water shortage, engineers estimated that 200 million gallons a day were being lost from leaky faucets and pipes alone.

Ground water is wasted in large parts of the West by phreatophytes, plants that often send thirty roots far down into the subsoil. Most of them are of low value—mesquite, salt cedar, cottonwood, willow; a useful one is alfalfa. The water they draw from the ground is eventually dissipated into the air.

The U. S. Geological Survey estimates that phreatophytes in Nevada waste five times as much ground water as is consumed for useful purposes. In 17 western States approximately 15 million acres of such plants are believed to consume enough water every year to cover 20 to 25 million acres one foot deep.

Floods in which vast amounts of water run off without sinking into the ground or being held by reservoirs, represent a resource whose only present contribution is to keep stream channels cleared out—a purpose that could be achieved by smaller, less wasteful flows.

Nothing Lives Without Water

Until it gets scarce, man gives little thought to the water he uses. Yet in many ways it is a strange liquid, unlike anything else on earth.

What is water? Everybody knows the famous chemical formula, H_2O , which means that one molecule of water contains two atoms of hydrogen (H) and one of oxygen (O). If you studied chemistry in high school you probably learned that water can split hydrogen in the presence of oxygen to make them combine.

Water covers nearly three-fourths of the earth's surface, and most of it is too salty to drink. But the oceans provide the gigantic reservoir from which water constantly evaporates to fall back upon the earth. Without water our planet would be a dead and desert world like the moon.

The human body needs more than a quart a day to replenish normal losses. Every day an average adult loses about a pint and a half of water by "inseparable perspiration" through

the skin and in exhaled air, in addition to that given off by the kidneys. Tests made by the U. S. Army show that a man working hard in the desert under average heat conditions loses water at the rate of nearly two quarts an hour.

Of the water that comprises about 66 to 70 percent of a normal human body, most is lodged in the billions of tiny cells that make up living tissue. Thirst becomes critical when the body has lost too much water without taking in a balancing amount.

Proportion of liquid to solid varies in different parts of the body. Saliva is almost 92.5 percent water, but tooth enamel has only 2 percent. Bones are about 22 percent water, muscles 75, and blood serum 92.

We take in water not only when we drink fluids but when we eat. Some physicians believe that many people in the United States do not consume enough water to maintain the best possible health.

Some plants and animals, like the cactus or the camel, have special mechanisms by which they can store water whenever it is available or get along on a minimum when it is not.

Our Water as Old as Earth

Water is rare and almost indestructible. It is one of the few things in Nature that can be used over and over again. We are drinking and using the same water now that existed when the earth was born.

This water is just as good today as it was three billion years ago. Though it may be polluted by wastes poured into streams, or made undrinkable by ocean salt, it becomes clean and fresh again as soon as it evaporates into the atmosphere.

Even rain water, however, is not completely pure chemically. It picks up many things, including traces of ammonium salts and gases from the air, and, when it falls near towns, a little sulphuric acid given off by burning coal. Absolutely pure water is unknown in Nature; even in the laboratory it is difficult indeed to get all foreign chemicals out of a water sample.

Minor impurities affect the quality of water. Rain water is "soft"; that is, it contains little or no calcium and magnesium.

"Hard" water contains more of these salts and ranges from moderately hard to very hard depending on the amounts present.

When used in washing, hard waters require much more soap than softer waters because part of the soap is consumed by these salts.

The resulting "curt" is largely responsible for the well-known ring around the bathtub.

Water can be softened by boiling, by treat-

* See "Today on the Delaware, Penn & Glenshaw River" by Albert W. Atwood, *National Geographic Magazine*, July 1951.



A Cloud-seeding Plane above the Catskills Hints Rain for New York Reservoirs

TOOK TO THE AIR in 1957 to disperse dry ice particles over the Catskill mountains, the first such project ever to be rain-making, probably, and New York City's hydroelectric reservoirs should be getting more water as a result.



rent with chemicals that precipitate out the salts, or by sand filtering.

Through infiltration our water supply has followed a regular cycle of absorption and loss. This is called infiltration. Even so, the water continues to move, and to the same extent it finally seeps into the earth. In some cases it may return to the surface through springs, but the surface water has a shorter lifetime. It loses it by passing through layers of soil and through rocks, or it may be taken up by plants that never reach the surface.

It goes without saying that we receive about 1,000,000,000 gallons of water a year—over 30 billion bushels of water. Much less is water lost in the air by evaporation. This is due to the fact that the water has been absorbed by the earth or the vegetation growing thereon.

Where Our Water Originated

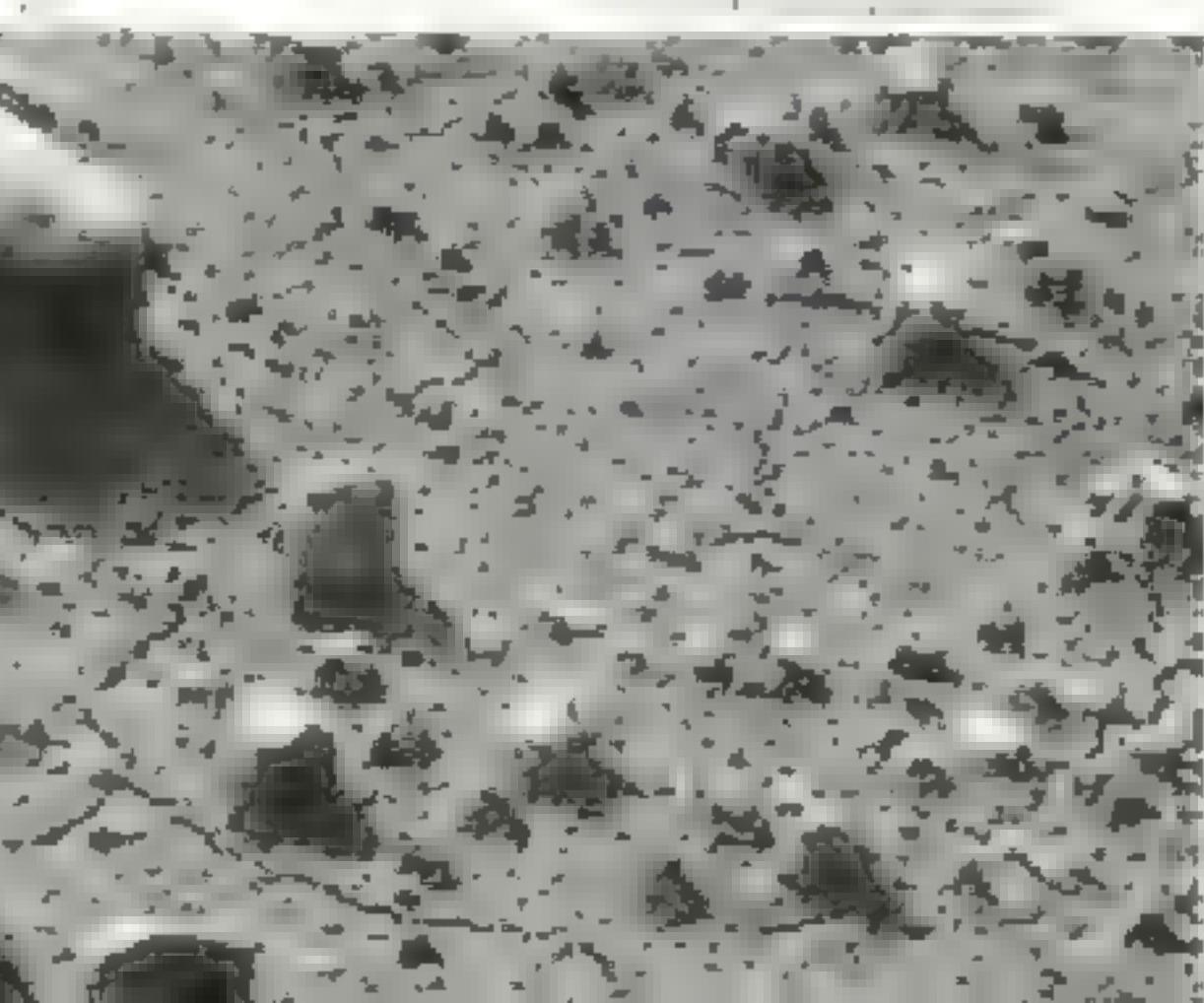
Many people hold that when the earth was new it did not contain more water than it does now, and that this fell as rain to fill the oceans. This is a theory based on the lack of imagination.

Others believe that all the water on earth was created by some wise Being.

Whatever the case, let us have it all. Of this huge store of water, however, only one-half is available for man's use. Rivers, lakes and the oceans round the world make up this amount of water. Most of this water is salt water, which is the ocean, and much of the rest is frozen in the great ranges of Greenland and Antarctica. The clouds that fall as rain pass on another greater way to the sea, and that is the ocean.

"Little Drops of Water . . ."

The following poem, based on the hymn, "Little Drops of Water," is a good example of the way in which the author has tried to make the simple poem more meaningful to the reader.



More fragile-looking than the well-known redwoods of California, the giant sequoias of the Sierra Nevada in California, northern Colorado and New Mexico have the distinction of being the tallest living trees in the world.

For a long time, they were the tallest trees in the world, but the American sequoia is no longer the tallest. It would be interesting to track it worldwide, especially now that the tree forest and trees

of the same species are reported at different heights depending on whether or not 20 percent of the trees form groves. A complete list of world-tall-trees probably would not be available until all the data is gathered from all the groves.

Most of the sequoias in the groves are tiny, scarcely larger than a thumbnail in diameter. When in their youth, they grow about two feet a year. As they mature, growth slows down, often to less than a half foot a year. In their old age,

roundish, rounded seedlings appear as they fall to the ground. These young trees are known as "stump sprouts." They may grow 10 feet tall in a single year. Some of the largest of these seedlings have been found to have their teardrop shape, "sandwiched" around the trunk.

The best place to see them is in Muir Woods National Monument, just west of San Francisco. Here, a 20-acre plot of ancient redwood trees, some 2,000 years old, stand in a dense, dark forest. They have been protected by law since 1908. In the east, in the Cascades and British Columbia, Canada,

In contrast, the other redwood kin, the coastal redwood, is native to the Pacific Northwest. It grows well in the cool, moist climate of the Pacific Northwest, where it can grow to 200 feet tall and 10 feet in diameter.

See also: *Redwood Tree*; *Sequoia*; *Tree*; *Wood*.

LIVING PLANTS PREVENT EROSION

Living plants are the best way to prevent soil erosion. They hold the soil in place by their root systems and by the organic material they add to the soil. An example of this is the use of grass and other vegetation to control soil erosion on steep slopes.





Southern China's Bamboo "Ferry Wheels" Raise Water to Thirsty Rice Fields

Down a hillside a man stands at his bee
and bamboo ferry wheel. He turns the wheel to lift water from a stream to irrigate his rice fields. The water is drawn from the stream by a pump that takes it up a steep hill.

AN estimated 40 percent of the world's farmland, part of the largest continent in the world, at vast, many numbers, see that extensive across Africa and extending through Saudi Arabia, Iraq, Turkistan, and Mongolia right to the Pacific shores of Asia (p. 261).

Irrigation Turns Deserts Green

Nearly a third of the earth's land surface receives 10 inches of precipitation or less annually. Yet another third the usual amount is only 10 to 15 inches. In places that get less than 10 inches, and on more than the area receiving up to 20 inches, irrigation is required for raising crops.

For maximum yield, even areas having 40 inches or more annually may need the magic touch of water sluiced through ditches if there are long dry periods during the growing season or if the climate is hot.

In the United States east of the 100th meridian, which divides the North from the South,

only in half, there is generally enough rainfall. Precipitation increases from 20 inches a year on the Great Plains to over 100 on the Gulf coast.

West of the 100th meridian, however, is where America's water trouble begins. Except in the rain-rich Pacific Northwest much of the West is arid unless irrigated. In parts of Utah and southern California soil appears only after irrigation is applied, and there are 100,000,000 acres of land that are irrigated. Nearly 22 million acres are irrigated in the 17 western States.

Why do places like Washington's Olympic Peninsula get so much rain while our Great Plains get comparatively little?

Washington, Oregon, and northern California are visited by prevailing west winds which bring heavy with moisture from the Pacific Ocean. When these wet winds reach the mountains

* See map, "The United States of America," a supplement to the June 1951 NATIONAL GEOGRAPHIC Magazine.

they are forced around the water level. Here convection takes place at the moisture fully saturated air.

The heavy snow caused precipitation in southern all United States. We include Canada, Washington, Oregon, Idaho, Montana, Wyoming, Colorado, New Mexico, Arizona, California, Mexico, and the winter storms. These are the areas east of the Rocky

Winds Converge to Make Rain

Rain and snow fall to us in the same manner that the wind does. In the high mountains of the Andes, the Gulf of Mexico, and the winter storms there are the areas east in the prairies.

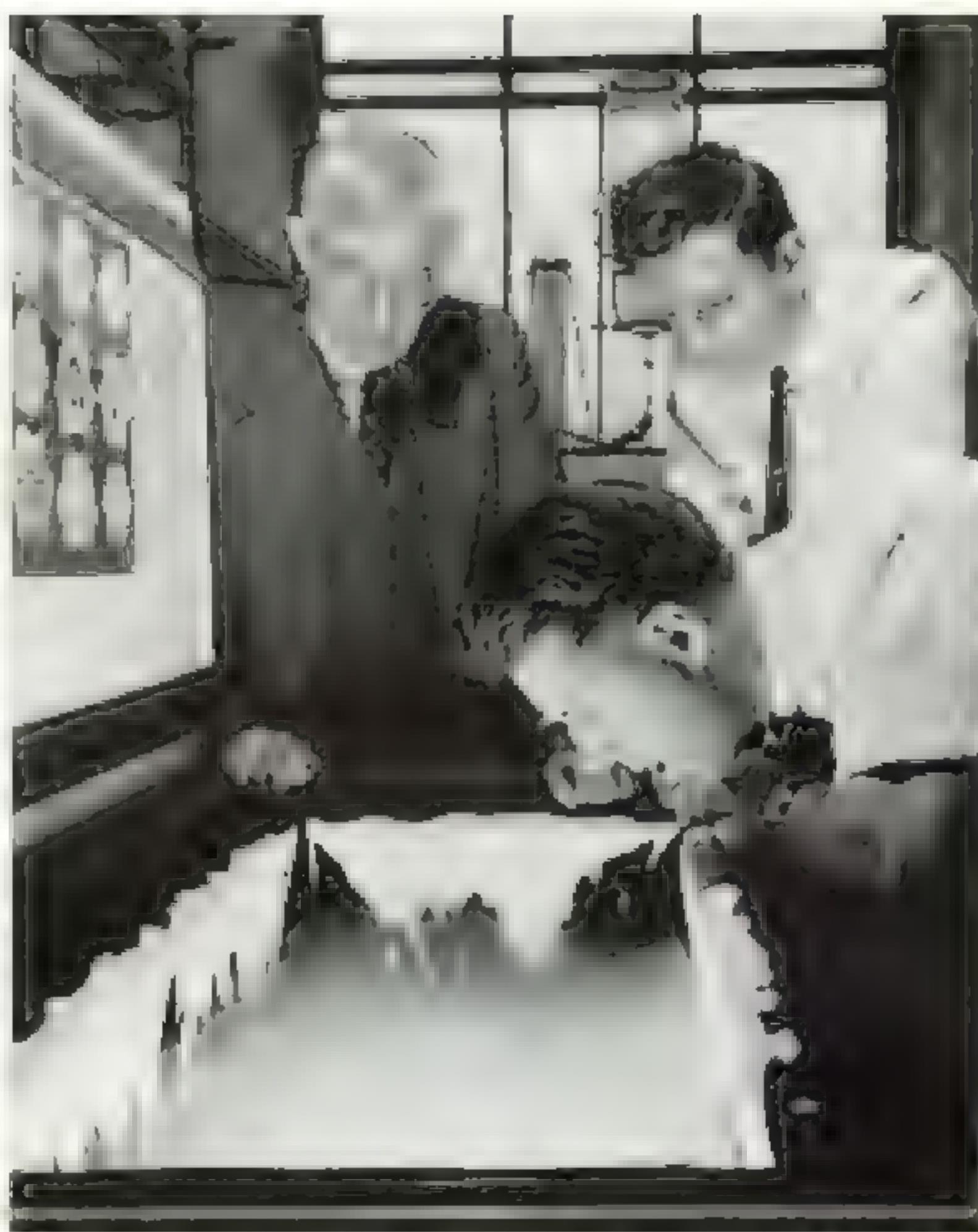
In northern Chile, in Argentina and New Mexico, the location of the winds are low in moisture. Over the rest of the world, no rainfall is evenly distributed. Europe is fairly well watered except parts of Spain. Most of Russia and Siberia have little or no rain.

On the other hand, some portions of the continent turn out more than twice of rain each year. Australia has large areas which receive much rain and vast arid deserts.

In South America rainfall is 15 in. in southwestern Brazil, crossing the north-south range of mountains. A broad expanse stretches from Mexico into the southwestern United States.

Drawing on Underground Deposits

The largest reservoir of water in the United States is underground. Water percolates downward through the soil and into the pores of limestone, sandstone, and clay, reaching depths where the rock is tightly packed by the pressure of overlying water, except at the surface. This water is then taken up from wells that are drilled into the rock. The ground water is what feeds nearly all springs.



You Can Brew a Snowstorm in a Home Freezer

Recently there was an advertisement in a popular magazine that said it was possible to make a snow storm in a home freezer. It may be more difficult than you might expect, but it can be done.

We all know just how much snow we have, probably more than in the United States has ever experienced, especially in the last few years. Much of the snow remains under the surface. You probably have noticed the conditions of the country.

We all know that in some areas we are actually in a position of water shortage. In the west our water from Nature is replenished by natural sources. Water that has been used for many years to accumulate.

In many areas where water once flowed freely from the soil wells it now have to be pumped. The U. S. Geological Survey reports that the ground water level has dropped in many areas more than 100 feet in some cases.

Of all the parts of the earth, this "water table" varies in depth. It's generally near



A Brute Fish Catches Missouri River Pond Water at Omaha, Nebraska

It is a common opinion that the Missouri River is too dirty to support fish life. This is not true. A recent catch of 1,000 pounds of fish was made in a pond at the Standard Oil Company's refinery at the mouth of the river.

The surface in villages, towns, and in rural ground water is turbid, brown, and of low oxygen content, owing to a few hundred feet of topsoil overlying the gravelly or loamy layer such as on the Gulf coast and coastal areas of the Great Plains, which is vulnerable to tide depths of more than 100 feet.

Ground water is what actually bears most of the strain, owing during dry periods. When rainfall occurs, the water is washed away from the ground except along and about the edges of the streams and the

water table, which is about 100 feet above the surface, and there is no ground water.

During World War I and II, deep installations for oil storage tanks, sand separators, and tank developments increased rapidly. In a former article, "A New Way to Detect Oil Leaks," it was shown that oil tanks were flooded with water after World War I.

Oil tanks keep the water from getting out. One reason is the water is too warm for some plants, so we have to cool it down with ice. Another is to keep oil from getting into ground water. During World War II, it was found that ground water was being polluted much faster than Nitrates could remove it, and that some of the wells would become unusable. The ground water was not down neither did it go up. The water was contaminated, and the water was mixed up with ground water.

Empty Wells Mean Empty Factories

Sixty-eight percent of the cities mostly in the interior West and central U.S. have no water. Eighteen of the cities of 50,000 or more are in the arid and semiarid areas of the West, including the states of California, Nevada, Utah, Colorado, Wyoming, Montana, and Idaho, in addition to the Great Basin and the Colorado Plateau.



Turbid River Water in a Few Months Dumped This Muddy Mess into a St. Louis Basin

On the left, a water sample taken from the Mississippi River at St. Louis shows the most noticeable pollution in the surface water. On the right, the same water sample taken after it had been filtered through sand and gravel, shows the reduction in turbidity.



Two Million Gallons Rush Through This Pipe Each Minute

A hand-drawn sketch shows the water flowing from the River Hudson. Millions of gallons of Hudson River water are carried through this pipe to New York City each minute. The Hudson River is one of the few rivers in the world that has no salt water in it.

to replenish the ground when pumped out in summer for factory use.

A later survey revealed that after 1900 the water level in the wells went east and southward toward the lake shore. The water receded.

Guarding Sources of Ground Water

At some points along the coast, fresh ground water has been found that sea water has seeped in making wells useless for drinking purposes. When the saltwater intrusion comes, the roads may well be advancing until wells can be drilled now will farther inland.

On Long Island where salt water began seeping into the ground under Brooklyn regulations were issued requiring that when a saltwater well was drilled, test holes in other locations must be drilled well to obtain water for irrigation and other purposes. This is a costly procedure which in return the next water goes to the ground.

Consumption of ground water is becoming heavy in a few states including New Jersey, Maryland, Connecticut, Wisconsin, Michigan, and State regulate its use to prevent salt water from west or States having rights for the water.

Springs where ground water reaches the surface supply pure and abundant water to thousands of American farms. The U. S. Geological Survey has listed 40 spring areas of which the largest enough to supply a town to the northwest of Denver, Colorado, are the two largest supplies of 2,000,000,000 gallons per year. The other three springs in that area are the present sites of large cities.

The spring beds develop around the base of the mountains, especially limestone, because water from extensive areas containing rocks is filtered

channels. Most of our large springs are in northern Florida, the Missouri Ozarks, central Texas, the Snake River Plain of Idaho, western Oregon, northern California, and central Montana.

Hot springs are formed by ground water that has come in contact with hot subterranean rocks. Geysers erupting periodically, like Old Faithful in Yellowstone National Park, spring from ground water collecting in underground chambers until it grows so hot that steam forces some up high into the air.

Ground water is preferred for many purposes, because it is generally pure and free from sediment and contains at a uniform temperature an important factor to man's welfare. Water from ground is used for drinking by about half the people in the United States.

Taking too much water out of the ground may cause more than just a water shortage. Mexico City is built on top of a subterranean reservoir; as wells draw out more and more water the entire city is slowly sinking.

There are similar spots in the United States where the land has sunk as much as eight feet.

Does "Seeding" Make Rain?

Many a farmer and rancher, like Sibley and his two brothers, has looked up to the sky with a prayer, as heavy white clouds loomed overhead but nothing fell.

Today most experts agree that it is possible, under the right conditions, to help bring rain down. Some scientists claim they have made about 200 extra rainstorms by "seeding" them either with dry-ice particles scattered from airplanes or with silver iodide under ground.

The May 1950 issue of *Scientific American* Magazine, December, 1951.



Armageddon of Biblical Fame Drove Water from This Spring

Women living near the Old Testament's famous battlefield in the Golan Heights went up and down the winding stairway at extreme risk to get their daily ration. Here men working for the Oriental Institute from America struggled to excavate the ruins. This ancient engineering work proved to be the largest of its kind in Palestine.

[Section 15 and 16] *Wetland Space*

For the first time in history, the world has been able to witness the birth of a new nation.

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CLARK KELLEY

Knows A GI Measures the Chlorine In a Purifier

The man in the suit is product manager for a General Electric chlorine meter. It can measure chlorine in water in less than a few hours. It can also have up to seven different parts in the same 15 milliliters of water, which

on the ground and carried aloft by air currents.

Leaders in this field were Drs. Irving Langmuir, Vincent J. Schaefer, and Bernard Vonnegut, of the General Electric Company (page 275). They are credited with having started the first artificial snowstorm in this country by air-dropping dry ice on clouds over Mount Greylock, Massachusetts, in 1946.

Dry ice, the rain makers say, adds cloud water droplets enough so that they touch to crystals that turn into rain. Silver iodide particles provide tiny nuclei around which water droplets in a cloud are believed to condense into raindrops or snowflakes.

Other scientists, including U. S. Weather Bureau experts, believe that in many cases where rain has fallen from clouds, it would have fallen anyway. In nature, perhaps, from those clouds. So here again, at much more research needs to be done before artificial rain making can be performed on a large enough scale of time and effort to make it really useful.

In arid parts of the West, water is very

rare, and others are already paying millions of dollars for cloud seeding. Some customers have been disappointed, but others are satisfied that seed has boosted their rain and their crops.

Rain making is loaded with legal problems. Who owns the clouds? If farmers seed clouds and produce rain, tent by baseball teams and resorts may lose customers.

During its drought, New York City hired a meteorologist from Harvard University to try to increase rainfall and replenish its nearly empty reservoirs. Much rain fell, but the scientist got only limited credit for only part of it (p. 27).

Last year New York was sued with some \$1,000,000 in damages from other communities and individual citizens, alleging the rain making had damaged their interests. In its defense the city claimed that the program had failed.

Most large American cities still find that their surest sources of water are surface streams or lakes, even though they often must build aqueducts many miles long to reach them. One of ancient Rome's longest aqueducts, 58.4 miles, was the Marcia, built in 143 B.C. Other aqueducts followed downward. In contrast, the city of Los Angeles had been unable for 30 years to tap the Owens River for water from the high Sierra Nevada. Tap soon, the population of the city and its metropolitan area had skyrocketed to such size that more water had to be brought in. Parker Dam on the Colorado River through 242 miles of aqueduct, including 92 miles of tunnels.

The old Roman aqueducts depended entirely on downhill flow of water, but in the Los Angeles aqueduct water is raised 1,617 feet by five pumping stations.

An even longer aqueduct, 430 miles, was built in 1903 to bring water to the Coober Pedy and Kalgoorlie gold mining fields in Western Australia.

New York City has already outgrown the water supply it receives through aqueducts reaching 100 miles into the Catskill and is developing new sources in the same area.

It too constructed the largest lake in Massachusetts for its modern water supply, which comes to the city from 65 miles away. It passes through a tunnel 12 feet in diameter.

San Francisco draws upon the Hetch Hetchy reservoir, 160 miles away, to irrigate the West.

water through the Coast Ranges by means of 52 miles of tunnel.

One of the great water-supply feats of all time is the U. S. Bureau of Reclamation's Central Valley Project of California. This transfers water from one river to the bed of another and eventually makes water available through exchange over an area 500 miles long to benefit sections where it is badly needed in the southern part of the State (page 278).²

Communities bordering the Great Lakes, such as Chicago, Cleveland, and Duluth, need only reach out far enough from shore to draw in lake water from beyond the range of city pollution, though that is farther today than formerly.

Conserving Our Liquid Assets

Today the United States is trying to control more carefully the water it has, so that as little as possible will be wasted and there will be enough for all. Recognizing this need, the President's Water Resources Policy Commission has made a Nation-wide survey, with recommendations for getting all possible use out of every drop from the time it falls on forest, farm, or city street until it evaporates or returns to the sea.

Strong emphasis, the Commission said, should be placed on multiple-purpose water projects with unified programs to control floods, store water for drinking and irrigation, and generate hydroelectric power. When we try to manage water, we should do it for a whole river basin, including in a single plan flood control, water supplies, power, navigation, irrigation, drainage, reforestation, soil conservation, and pollution control.

More than ever before, this country is making progress toward doing away with water pollution, caused both by sewage and by factory wastes. Fish are coming back and people again can safely bathe in many streams that once were little better than open sewers.

Much remains to be done. Water from many streams and lakes is still unfit for human use unless carefully filtered and chlorinated.

Cleansing Streams Pays Dividends

Polluted water kills not only fish but also the aquatic plants that provide food for waterfowl. Pollution once reduced the annual value of the salmon catch in the Willamette River, Oregon, from \$5 million to \$1 million, but new sewage-treatment plants will remedy the situation.

In 1900, for every 100,000 Americans, 10 to 40 persons died of typhoid fever, a disease spread by polluted water. Today typhoid is a rarity in this country, partly because practically all large cities now have sewer systems, partly because drinking water

almost everywhere is treated to make it safe.

Originally most sewer systems emptied waste products directly into streams, harbors, or lakes, making the water unsanitary for drinking or bathing. Oyster-harvesting grounds in Hampton Roads, Virginia, were closed in 1926 because of pollution from surrounding cities. Today, since the building of four sewage-treatment plants the water is so much cleaner that 2,240 acres of the oyster-ground area have been reopened.

Many factory wastes, also formerly dumped into streams, now are turned into useful products and sold at a profit. A chemical company found that its waste had a high vitamin content. Processed into vitamins, it is now the firm's leading product.

A steel company built a treatment plant to recover ore from blast-furnace flue dust once discharged into a nearby river. It made a profit of \$381,000 in the first year of operation. Another steel mill's "pickle liquor," a sulphuric acid by-product, once poured into a nearby stream, now is given to a local firm that uses it to make iron sponge for gas purifiers.

Chemicals "Wash" Drinking Water

Water that could cause sickness if drunk in the raw state often can be made safe with the aid of chemicals and filters. Treatment is done on an assembly-line basis by many cities and towns by filtering the water through sand and gravel, and by aeration. Copper sulphate, alum, chlorine, and sulphur dioxide are added as required to kill bacteria and remove taste and odor (page 277).

Not a single death from cholera and typhoid, both water-borne diseases, has been recorded among American armed forces in the Korean war, partly because all were inoculated against them, but also because troops are trained to consume only purified water and avoid eating either raw vegetables and fruits (opposite page, page 286).

In World War II American troops were issued Halazone tablets containing chlorine, which purified water when dissolved in it. They helped to hold down the rate of sickness from water-borne diseases.

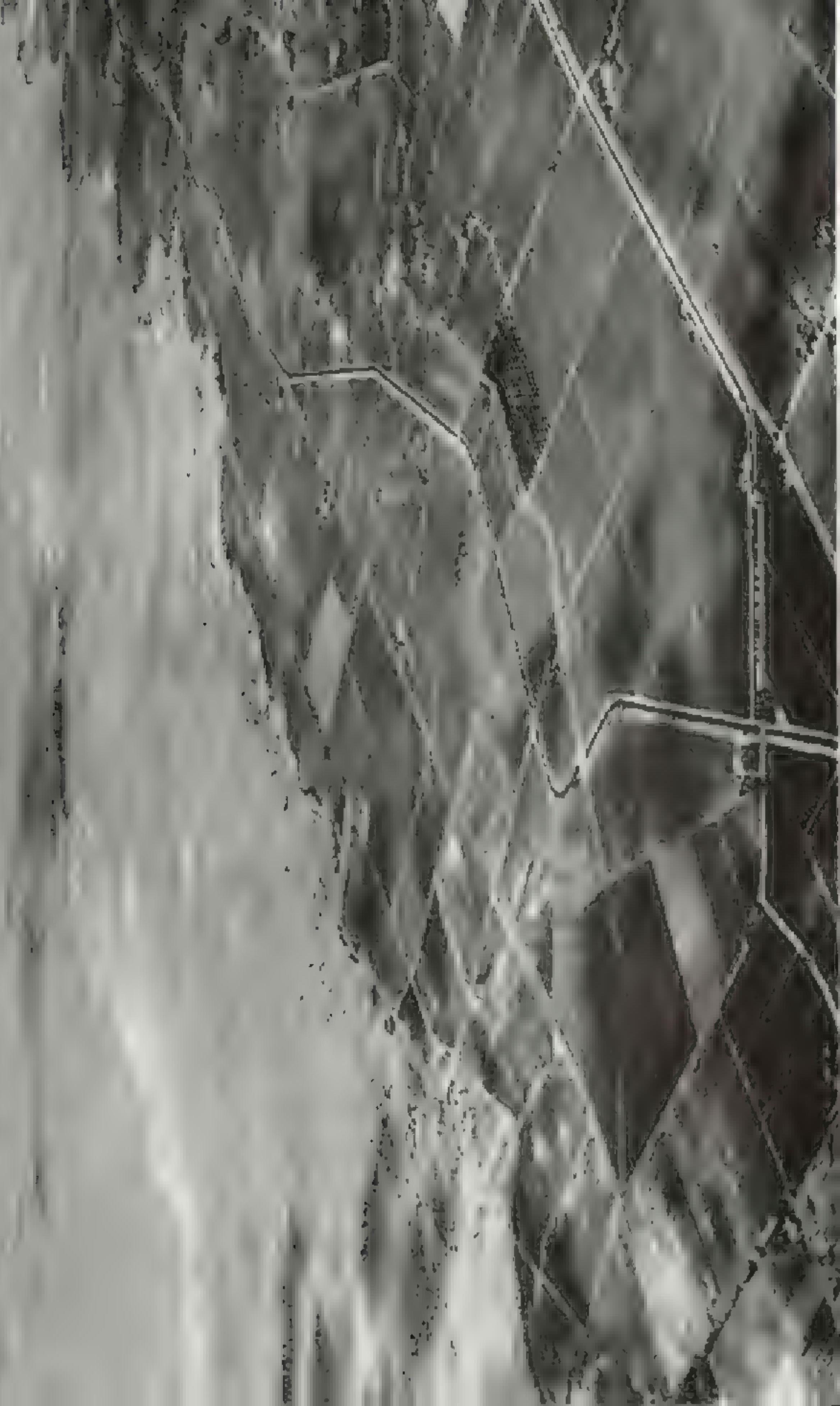
Today these tablets are being replaced by a new type containing iodine, which is more effective against some forms of dysentery. They also give water a less unpleasant taste, which sometimes made soldiers reluctant to use the chlorine tablets.

How to keep our rivers from being muddied and clogged by sediment washed down from upstream slopes on farmlands is another

² See "More Water for California's Great Central Valley," by Frederick Simplot, *NATIONAL GEOGRAPHIC MAGAZINE*, November, 1948.



Then said the Lord unto me, See, I have given him a spirit of prophecy over the land, and he shall bring my words unto thy people, and unto all other people, whom I shall send him unto. And he shall not refuse them; for he shall be able to speak unto them, for he shall know their language, and he shall speak unto them, and they shall hear him. And he shall say unto them, Thus saith the Lord God, Behold, I will bring upon you a prophet, like unto me, from among your own countrymen, whose name is Jeremiah; and he shall speak unto you all that I command him, and ye shall obey him. And if ye will not obey him, then shall ye be brought into captivity.



problem now being tackled on a Nation-wide scale. Some streams, as the saying goes, still are "too thick to drink, too thin to plow" (pages 2 and 277).

When great dams are built to store water for flood control, irrigation, and power, sediment too often flows in with the water and gradually fills the reservoirs. Behind Hoover Dam, in Lake Mead, from which southern California draws much of its water, sediment is accumulating at an estimated 100,000 acre-feet a year. If this siltation continues at the present rate, authorities say, the lake may disappear in some 430 years, with only "run of the river" water available for power and water supply unless silting is reduced.

Silt Filling Many Reservoirs

Many smaller reservoirs have already been silted out of use and abandoned. Studies by the U. S. Soil Conservation Service indicate that at least a fifth of the 3,000 municipal and industrial water-storage reservoirs now in use in the United States will have to be replaced or supplemented because of silting in the next 50 years.

Much of this silt is washed from land used for crops or grazing, where the soil is not sufficiently protected against erosion. But erosion is being attacked on a large part of the Nation's farm and pasture land, where terracing, contour planting, crop rotation, and better management of grazing and timber are practiced under guidance of the U. S. Soil Conservation Service, Forest Service, and the Department of the Interior. More farmers and ranchers are adopting these practices every year.

If sea water could be made fresh cheaply, all the water worries of our great coastal cities would be over. Already we know how to do it, but so far the cost is too high to make it practicable on a large scale.

Science Desalts the Sea

Untreated sea water is unfit to drink because it contains a higher percentage of salt than the human body can handle. Actually, water is drawn from the tissues, and the body becomes dehydrated. Therefore, drinking sea water soon adds to thirst instead of relieving it.

A lifesaver for thousands of sailors and airmen cast away in boats or life rafts in World War II was a chemical unit for making sea water drinkable in small quantities. Salt water is scooped into a plastic bag, and a small chemical briquette is dropped into it, which in a few minutes removes the salts. Drinkable water made this way costs about \$10 a quart.

The practical way to turn salt water into fresh is to distill or evaporate it, the same

process Nature uses when water is drawn from the sea up into the clouds.

Stills developed just before World War II provided temporary drinking water from the sea for more than a million troops in the South Pacific and North Africa until local supplies could be developed.

Brackish water from wells in Saudi Arabia is distilled to make it potable and safe for oil workers. Many ships distill sea water for drinking.

Some new stills work on the principle of vapor compression. Steam is compressed mechanically, a process which raises its temperature and also causes it to condense into water at a higher temperature. Heat given off as the steam condenses is used to evaporate more water in the still.

Once started, this process is continuous, and the only power needed is for running the steam compressor.

Three stills that can produce 50,000 gallons each per day from the sea are in use on Johnston Island, in the Pacific, where other sources of water are slim.

Frozen Reservoir—the North Pole

Freezing is another way to make sea water drinkable. Polar explorers well know that sea ice melts down into fresh water. When water freezes, the molecules get together in a solid crystalline arrangement. But the molecules of impurities have no tendency to adhere to the growing ice crystals, and become concentrated in the remaining sea water.

Scientists have recently developed a small-scale model of another device for desalting sea water. In their machine, briny or brackish water is passed over special plastic membranes and the impurities removed by application of small amounts of electric power. Water emerges from the machine in two streams—about two-thirds in one stream as fresh water, the other third containing the salts and impurities.

Inventors of the device estimate that, where electric power is cheap, salt water could be purified at a comparatively low cost; moderately brackish water, available in quantity in parts of the West, could be treated even more cheaply.

A noted chemist has predicted that before the end of this century some source of inexpensive energy, perhaps power created by harnessing the sun's heat, will become available so that fresh water can be produced from the sea at reasonable cost.

By such research, both here and abroad man is making a long-range attack on his age-old problems of water, that liquid asset without which none of us could survive more than a week.

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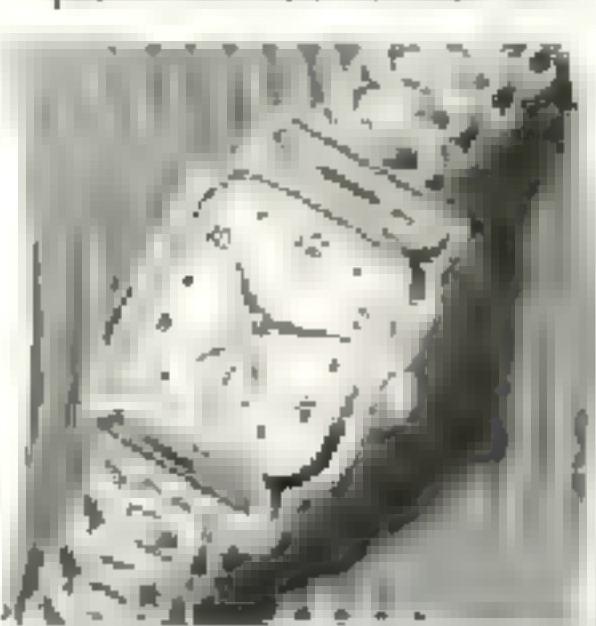
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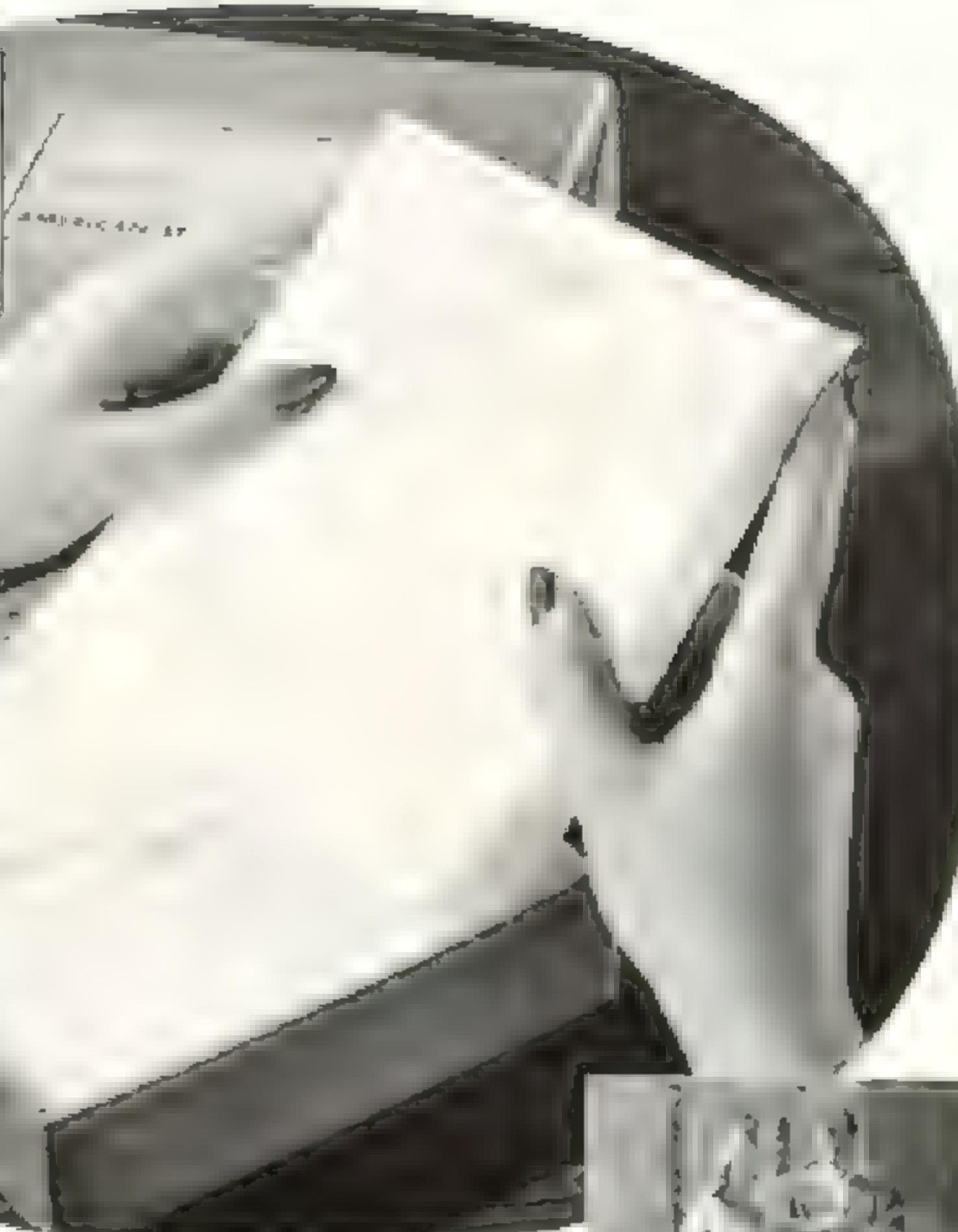
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TIPS ON TRAVEL

by BRADLEY WESTON

World Traveler, Author and Travel Columnist

WHERE LIFE HOLDS A THOUSAND CHARMs

By October people here are finding the time while everyone else is off carousing around about town—out-of-side, do-it-fool, for the cause ain't hot. There is still the Fall. While the heat folk on this side of the sea are bundling up in rags, the vacation season goes on swimmingly in Southern Europe.

When Autumn comes to Italy, it is both fashionable and pleasant to repair to the watering places— to Fiuggi, to Salò Maggiore, to Montecatini. One stops there, takes the cure, listens to the open-air concerts morning and evening, and returns home ready to face winter with a smile.

Chic Clientele at Ischia

People water holes here are numerous, and at the surface warmed to fifty degrees, turtles sun full of radiosity. Up at Montecatini, also Florence, you sit under shade trees, listen to the land, sip the water and eat magnificient food.

Ischia, the island near Capri which was the haunt of youth of the old Romans, is popular again. Back in the old days it was a safe bet for the theorist—a man could get running around a drafty form in a thin toga. Today its waters are described as the most radioactive in Europe, and it attracts a chic clientele to match.

Carnival of Eating

All of fashionable France repairs to the Basque Country in the Fall, when the season centers around the sea-side resort of Biarritz. Folklore festivals featuring fiery Basque dances, and gaiety in Biarritz are continuing well into through September. A mild form of bull fighting, known as *taurobolio*, is held in the

Basque towns in early Fall and also in the more human areas at Arles in Provence.

While all this get-up is rampant in the south of France, up in Burgundy the Burgundians are having at their favorite sport—eating. France's list of fall festivals is headed by Dijon's Gastronomic Fair, a two-and-a-half-week caloric binge.

Jai Alai between Courses

The Fall leaves long down in Spain, the pulse of life gradually turning from the resorts to Madrid, Barcelona, and Seville. In the capital, still goes on at *Paseo de Hierro* Club's course, there are pigeon-shoots, soccer matches and, of course, *jai alai*. At Madrid's Recoletos, a smart dining spot, you watch *jai alai* between courses and dances. Theaters and movie houses don't open until 11 p.m., and the crowd doesn't filter into the night clubs until 1 a.m. Most clubs charge a cover charge of about fifty cents. And if you want to put on the *Feria Santa Ana* you can hire a troupe of Flamenco dancers and a private room still well past dawn for the likes of twenty dollars.

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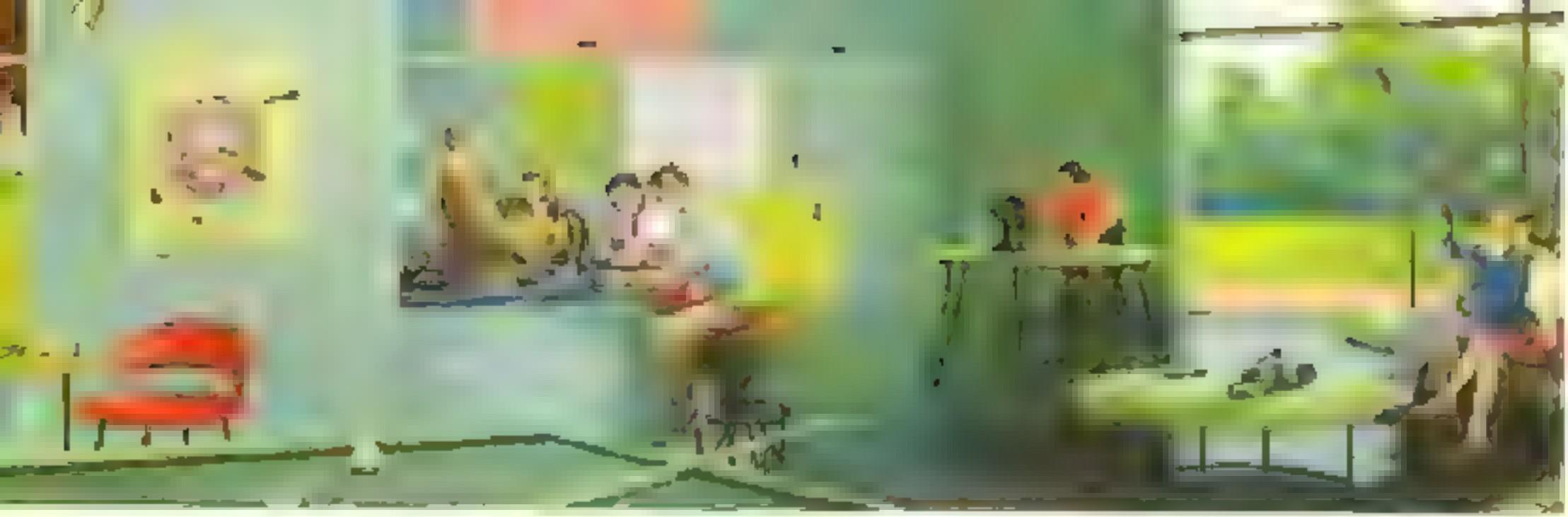
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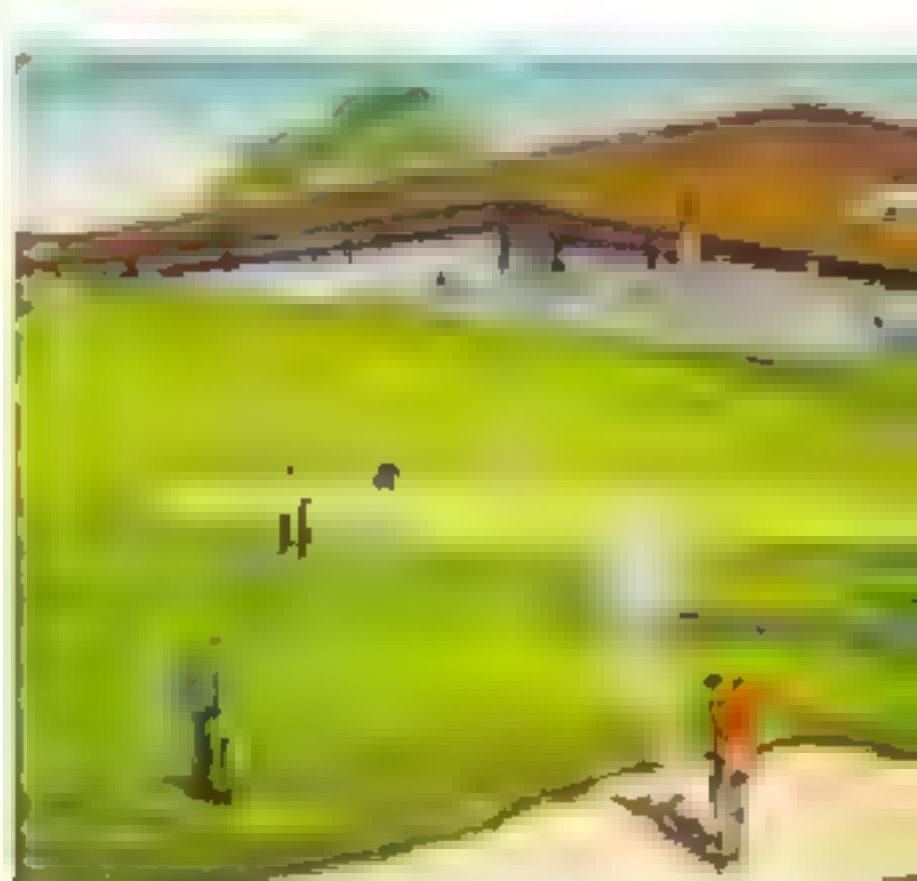


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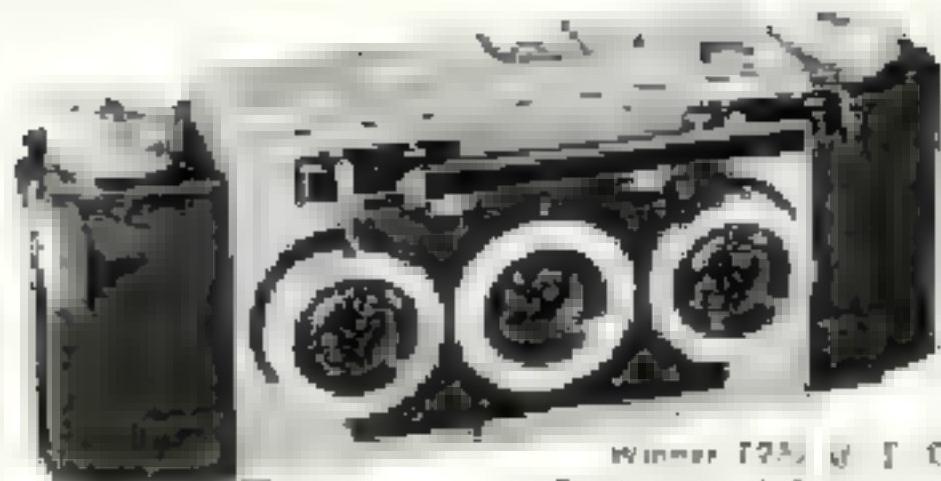
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The General Field, along with
the great cities and the extended
Rivers, form the physical features
of the Island and the Continent.
On land, ships are well equipped
with glass, gunnery, and firearms
at most ports, with certain Engi-
neering contrivances for making
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ever, about twenty-five or thirty
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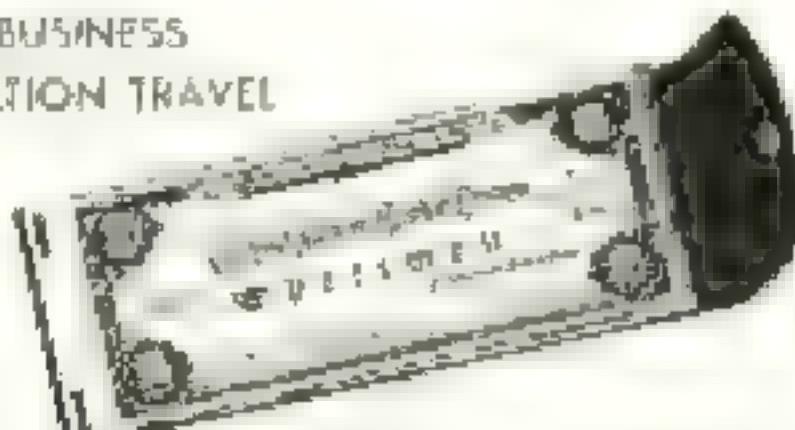


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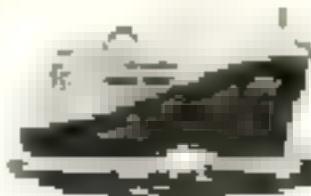
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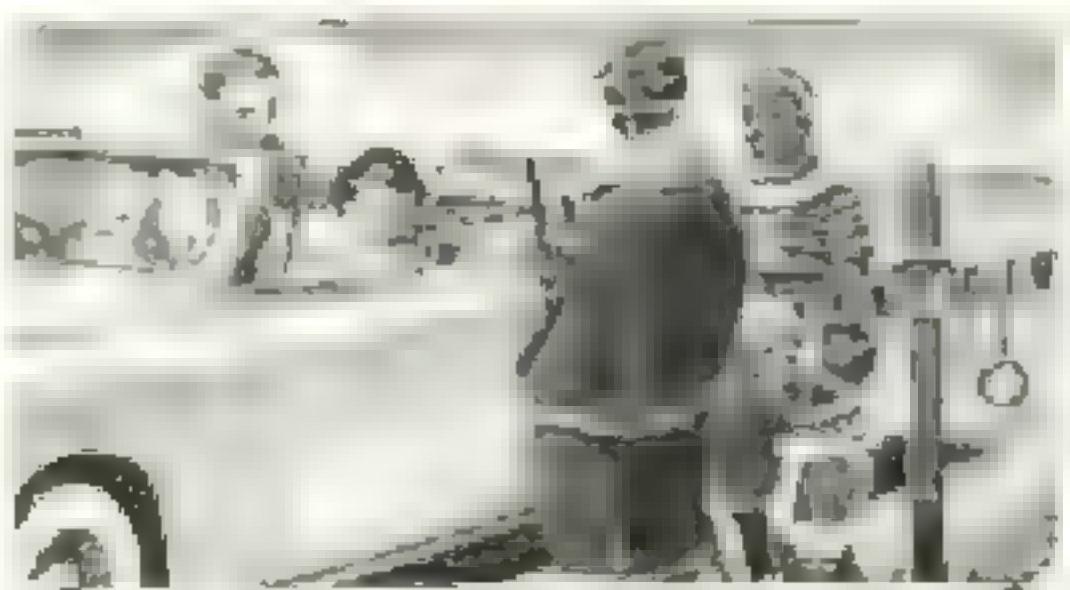
South AFRICA

• Land of contrasts...
South Africa is a land of
contrasts. From the
fertile vineyards of the
Western Cape to the
steep, rocky slopes of the
Karoo. From the
deserts of the Kalahari to
the lush forests of the
Drakensberg. From the
white sand beaches of
the Orange River to the
black sand beaches of
the Cape. From the
vast, open plains of the
veld to the dense
forests of the Drakensberg.
From the rugged
mountains of the Drakensberg
to the flat, arid
plains of the Kalahari.
From the
steep, rocky slopes of the
Karoo to the
fertile vineyards of the
Western Cape. From
the deserts of the
Kalahari to the
lush forests of the
Drakensberg. From
the vast, open plains of
the veld to the dense
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From the rugged
mountains of the
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plains of the
Kalahari.



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South African Tourism

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A black and white photograph of a classical building facade. The facade features a series of columns supporting a decorative cornice. The columns are fluted and appear to be made of stone or concrete. The cornice is ornate, with intricate carvings and moldings. The building is set against a dark, possibly cloudy sky. The overall style is neoclassical or Greek Revival.

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A black and white photograph of a framed portrait of a man in historical attire. The portrait is mounted on a dark wooden easel or stand. The man is wearing a white shirt, a dark waistcoat, and a dark cravat. He has a powdered wig and a mustache. The portrait is set against a light-colored background.

• 100% original content • 100% free

The work on television has been
done by the New Zealand Television Board
and the new Zentech Royalty Line
products. After a thirty three year
experience in television, it is considered
products of radio-IC science.

I have who have dreamed of one
moving up to it's level -
moderately sur that we'll be

The word *overcome* is used to mean
that the person has been able
to stop and change his or her ways
so that he or she will not do the
bad things again. It can also mean
that we have been successful in
dealing with the mind for training
ourselves in the qualities that

lance and sharp cornered —
impaled — **the** **reindeer** —
put **in** **the** **water** — **in** **a** **procession** **for** **Wash**

And to you who have experienced difficulties with your children—no area except one—a promise of a continuing improvement. Let me assure you that I am not enthusiastic about our present educational system, but I do believe that it can be improved.

How does it end? The answer is simple: a good teacher is a good teacher because he or she has **IDEAS**.

Here is the result of months of
long and hard work virtually 100%

power. We made the road of
such great use. The road
and the bridge have been in
bearing another year, half assem-
bling. The result of controlling
such a number of parts, is to make
the craftsmanship power work for
the good of the people.

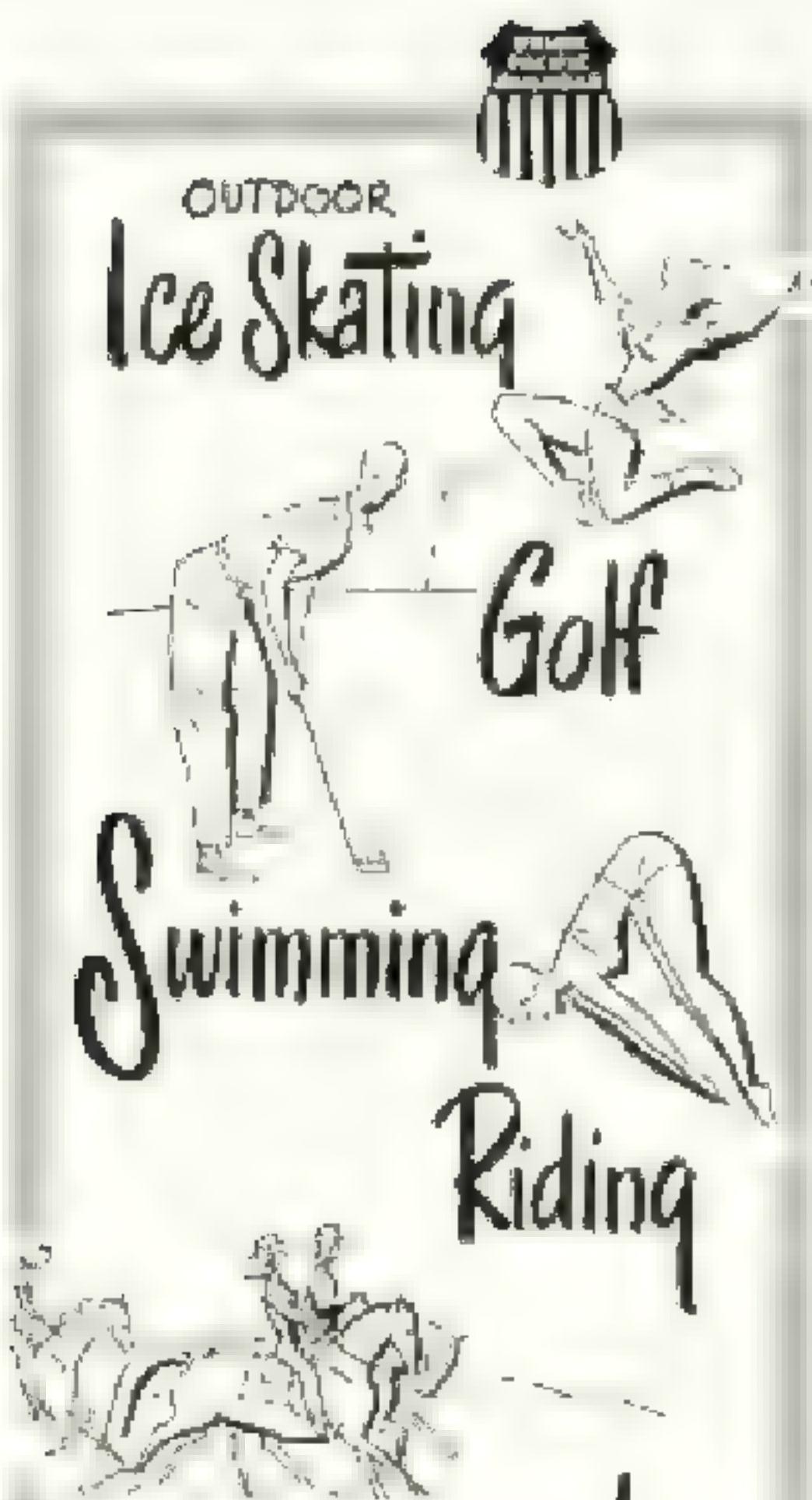
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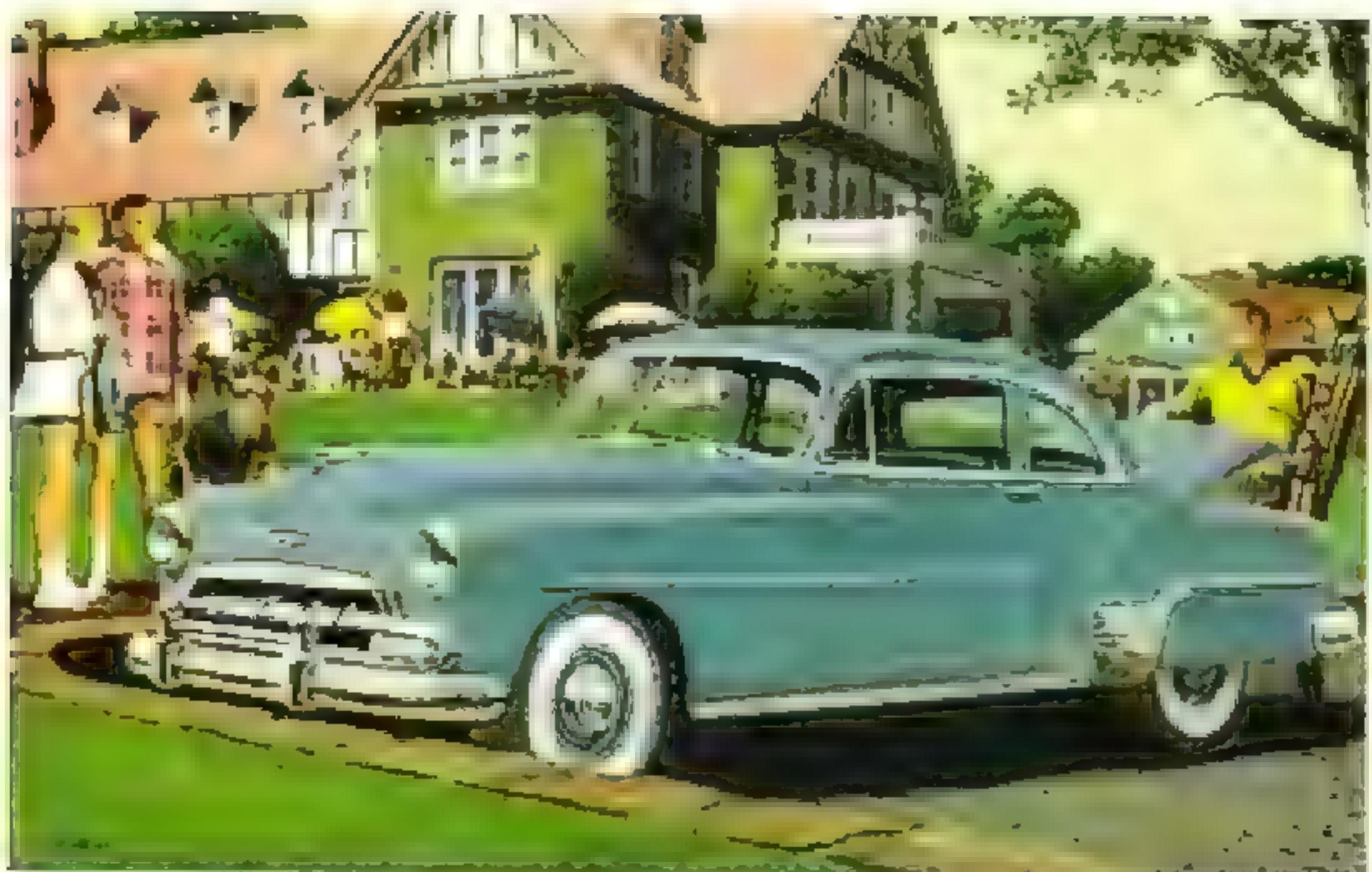
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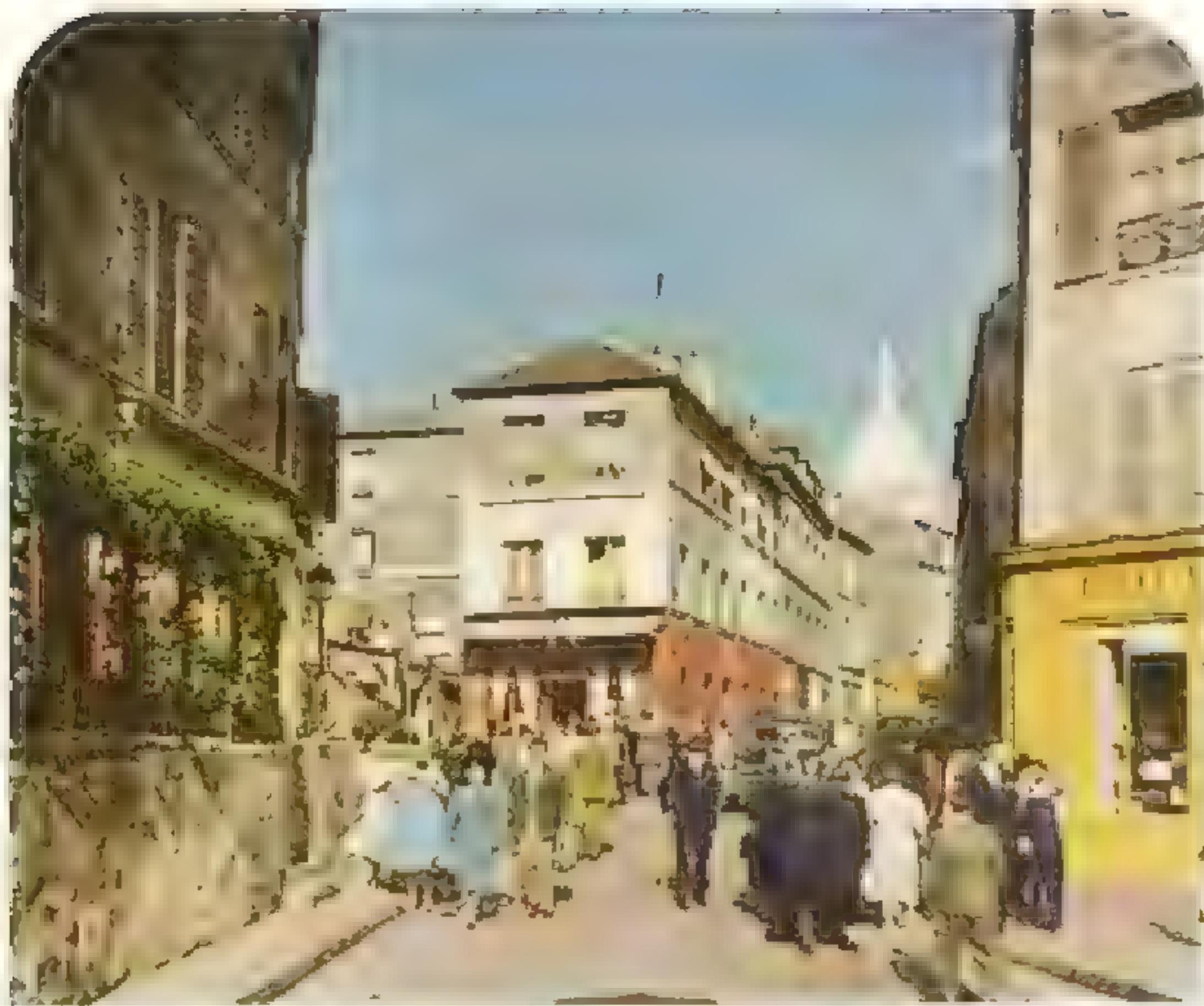
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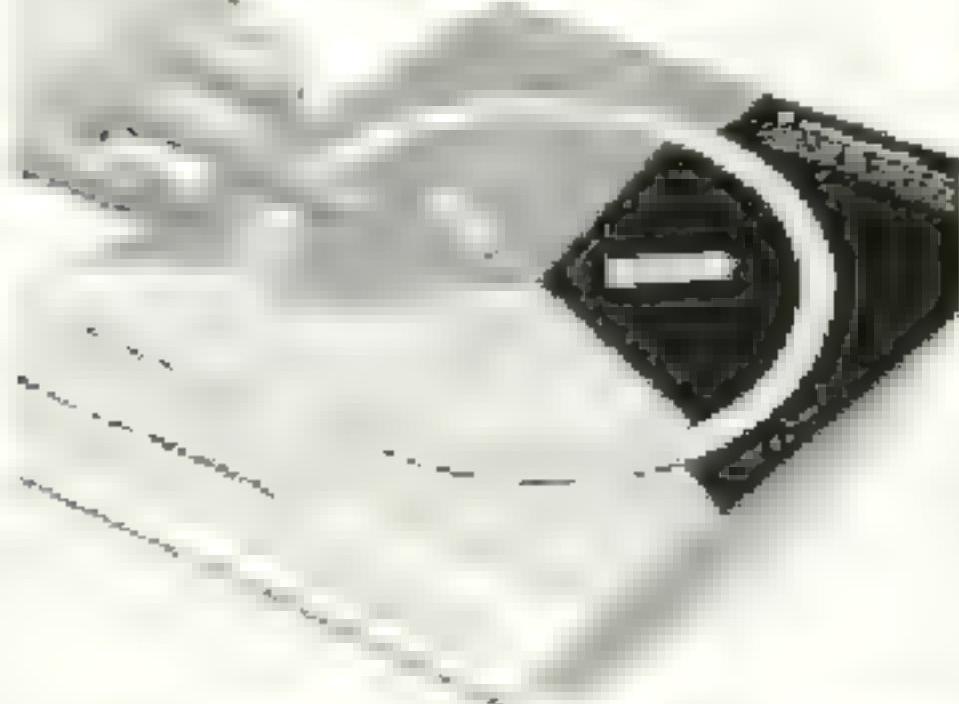
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The Land of Unborn Babies

In Merton's play—

"The Blue Bird," you see the exquisite Land all mystic blue—where countless babies are waiting their time to be born.

As each one's hour comes, Father Time sweeps wide the big gate. Out flies the stork with a tiny bundle addressed to Earth.

The baby comes hastily at leaving its nest of soft, sleepy clouds—not knowing what kind of an earthly "nest" it will be dropped into.

Every baby cannot be born into a luxurious home—cannot find awaiting it a dairy, hygienic nursery, rivaling in beauty the misty cloudsland.

But it is every child's rightful heritage to be born into a clean, healthful home where the Blue Bird of Happiness dwells.

As each child is so born—

the community, the nation, and the human race suffer. For just as the safety of a building depends upon its foundation of rock or concrete so does the safety of the race depend upon its foundation—the baby.

And poor as there is no use in repairing a building above, if its foundation is weak, there is no use in hoping to build a strong one below except through healthy, happy babies.

Thousands of babies—

die needlessly every year. Thousands of rickety little feet falter along Life's Highway. Thousands of imperfect baby eyes strain to get a clear vision of the wonders that surround them. Thousands of defective ears cannot hear even a mother's lullaby.

And thousands of physically unfit men and

women occupy back seats in life, are counted for uses—all because of the thousands and thousands of babies who have been denied the birth-right of a sanitary and protective home.

So that wherever one looks—the need for better homes is apparent. And wherever one listens can be heard the call for such homes from the Land of Unborn Babies.

The call is being heard—

by the schools and colleges that are establishing classes in homemaking and motherhood; by public nurses and other noble women who are visiting the homes of those who need help and instruction; by the hospitals that are holding Baby Clinics.

By towns and cities that are holding Baby Works and health exhibits; by magazines and newspapers that are publishing articles on prenatal care.

By Congress that has passed the Mothers and Babies Act, under which health boards in every State will be called upon to give information to expectant mothers.

All this is merely a beginning—

The ground has hardly been broken for the Nation's only safe foundation—healthy babies—each of whom must have its rightful heritage—An Even Chance—a healthy body.

The call will not be answered until every mother, every father and every community helps to make better homes in which to welcome visitors from the Land of Unborn Babies.

Babies of 1922 have a far better chance of growing up to be sturdy and healthy than did babies born in 1911, the year in which "The Land of Unborn Babies" happened.

In fact, the great gain has been made in protecting child health—through diet, immunizations, and knowledge of infant growth and development—represent one of medicine's greatest

triumphs. Today, the infant mortality rate is, by all odds, the lowest in history.

Equally令人震惊的是 the drop in maternal mortality rates. At present the chances of an expectant mother surviving childbirth are better than 99 out of 100. In these figures there is truly a story of human and social progress.

Metropolitan Life Insurance Company



Unwind it, and there's a Pangolin!

If you're a golfer or hiker, or like me, a backpacker, you know that the Vagabond's got it.

But if you get stranded while he's out in the open, the pangolin's only weapon is his body. And that's not much of a defense. And not even a good one, like a pufferfish, which can't be passed him by.

Unfortunately, you can't curl up, like a pangolin, when you get hurt, so you can

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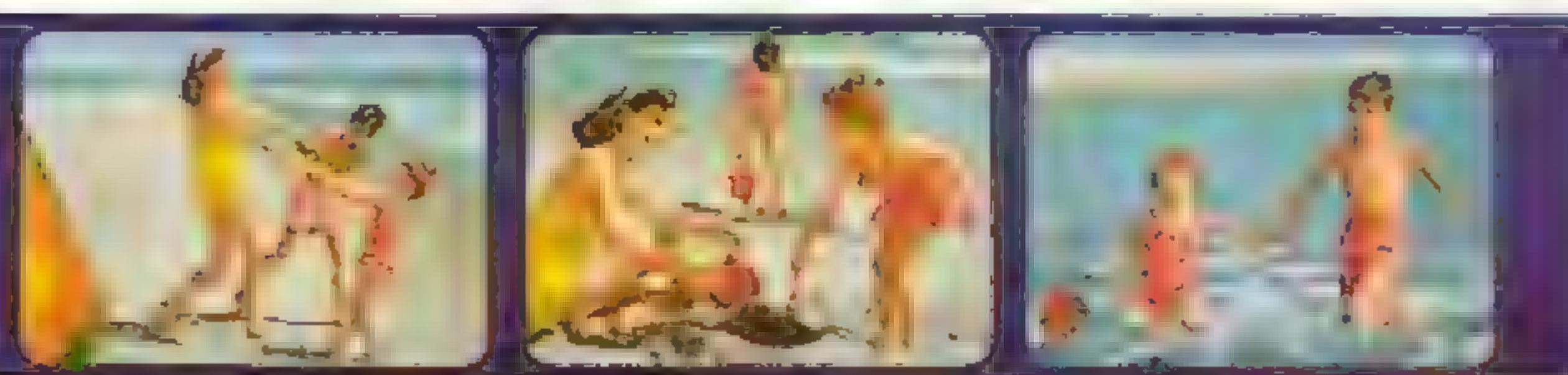


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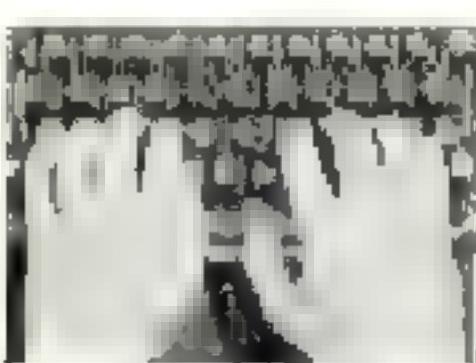
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Call by Number**

A HELPFUL HINT—Start today to build up a list of out-of-town telephone numbers. Write down those you already know. If there's a new number you don't have—or an old one you've forgotten—be sure to add it to the list when the operator gives it to you.



"You'll save time if you give me the out-of-town number you're calling.

"That way I can put your call through without first calling 'Information' in the distant city.

"Your own call goes through faster. And you help speed the service for everyone. That's especially important now, when so many urgent defense calls are on the Long Distance lines."

BELL TELEPHONE SYSTEM





REVOLUTION ON RAILS This is RDC—the Budd-built, stainless steel, self-propelled rail diesel car. It can operate as a single unit, or it can be coupled with other RDC's to form a train.

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PIONEERS IN BETTER TRANSPORTATION